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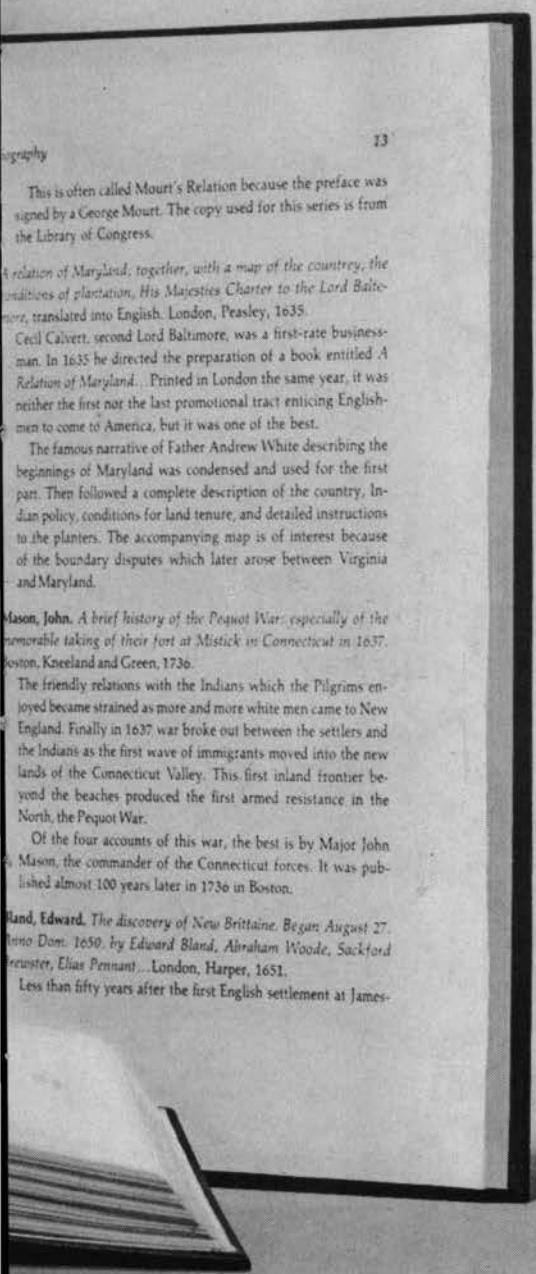

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The Higher Education Act of 1965: A Symposium

At ACRL's membership meeting in New York on July 13, three speakers—each from his own vantage point—discussed the meaning of the Higher Education Act to the nation's academic libraries. Germaine Krettek, director of the ALA Washington office, began with a report on the background and status of the Act. Charles F. Gosnell, director of libraries, New York University; Everett T. Moore, assistant librarian, University of California, Los Angeles; and Helen M. Welch, acquisitions librarian, University of Illinois, spoke respectively on implications for library administration, reference service, and resources and technical services. Maurice Tauber, Columbia University school of library service, summarized the speakers comments, and spoke on guidelines for preparation of grant requests, and implications for library education, and recommended future ALA division activities.

THE HIGHER EDUCATION ACT OF 1965: BACKGROUND, PROVISIONS, ADMINISTRATION

BY GERMAINE KRETTEK

AT THIS possible three-quarters point in the second session of the eighty-ninth Congress, Senate committees are still considering several measures relating to the Higher Education Act of 1965. The status of the proposed amendments and the appropriations is this:

On May 13, six months after the Higher Education Act of 1965 became law, President Johnson signed the Supplemental Appropriations bill which provided limited funds to implement P.L. 89-329 for the fiscal year which ended June 30, for TITLE II—COLLEGE LIBRARY ASSISTANCE and LIBRARY TRAINING AND RESEARCH. Ten million dollars was appropriated for Part A—college library resources; $1 million for training of librarians; and $300,000 for the Library of Congress program of acquisition and cataloging of research materials. No appropriation was made for library research.

Facing a deadline of June 30, the Library Services Division of the U.S. Office of Education did a remarkable job in getting the guidelines and regulations approved, necessary forms and information out to the approximately twenty-one hundred institutions, over nineteen hundred applications processed, and the checks totaling over $8 million mailed within the brief period of two weeks (sent out May 20-21; back by June 4). It was an almost round-the-clock operation.

On the other side of the coin, colleges and universities did an equally fine job of getting their applications mailed in record time and we trust the eighteen hundred and ten institutions who received grants got their funds obligated by the end of June.

On July 1, the new 1967 fiscal year began but appropriations are not yet available. This year, however, the President's budget included recommended amounts for all titles of HEA and for all parts of Title II. The Administration asked a total of $35.3 million for Title II. Of this amount it is expected $25 million will be allocated for resources, $3.75 million for training, $3.55 million for research, and $3 million for the Library of

Congress acquisition program. The American Library Association testified at both House and Senate hearings on the HEW Appropriations bill (H.R. 14745) and strongly urged the appropriation of the amounts authorized—$71,315,000 rather than $35.3 million.

The House of Representatives, however, has approved the budget recommendations. The Senate Appropriations Committee has completed hearings but has not yet issued its report.

According to Sec. 205 (a) of the law, an Advisory Council on College Library Resources is to be established in the U.S. Office of Education, consisting of the Commissioner as chairman, and eight members appointed by the Commissioner with the approval of the Secretary of HEW. It is anticipated that President Johnson shortly will announce the establishment of this council to advise the Commissioner with respect to establishing criteria for making supplemental and special purpose grants.

After the council is established, new guidelines and regulations will be drafted and promulgated.

The Commissioner is also authorized to appoint a special advisory committee of no more than nine members to advise him on matters of general policy concerning research and demonstration projects relating to the importance of libraries and the importance of training in librarianship.

In connection with PART B of TITLE II —Library Training and Research, it should be kept in mind that this section provides for the training of all types of librarians. In relation to the training of school librarians, there is specific provision for the continuation of the School Library Institutes, which are included in Title XI of the NDEA, through the next fiscal period but thereafter will be funded under Title II, B.

At this very hour, Carolyn Whitenack, associate professor of library science and audio-visual education, Purdue University, and president-elect of AASL, is in Washington testifying before the Education Subcommittee of the Senate Labor and Public Welfare Committee on those aspects of the Higher Education Amendments of 1966 which are of particular concern to libraries and librarians. Some of the provisions of S. 3047 and H.R. 14644 that ALA is supporting relate to facilities, the extension of Title III of HEA—Strengthening Developing Institutions, and a technical amendment to Title II, Part A, to correct certain inequities in the maintenance-of-effort provisions in the program for college library resources. A statement concerning the importance of the School Library Institute program is also being stressed in her testimony.

Two other titles of the Higher Education Act of 1965 have important implications for libraries which have been overlooked by some college librarians because of the emphasis on Title II.

Title V, Part C, provides fellowships for recent college graduates and other college graduates who plan a career in elementary and secondary education. Fifteen hundred and thirty of these prospective teacher fellowships have been awarded for study beginning in the 1966-67 academic year; seventy of these fellowships are in librarianship.

A separate program exists for experienced teachers.

Another title with specific implications for college libraries is VI—Financial Assistance for the Improvement of Undergraduate Instruction. Audio-visual equipment for the college library is specified and in Part B—Faculty Development Programs, provision is included for the training of librarians in the use of educational media equipment.

These are the highlights of the major portions of the Higher Education Act of 1965. It is a landmark measure, and should do much to improve college and university libraries if full advantage is taken of all titles.

■■

THE PROMISE FOR REFERENCE LIBRARIANS

BY EVERETT T. MOORE

No words could please reference librarians more than those which appear in the Higher Education Act of 1965 under the matter-of-fact heading of "Strengthening College and Research Library Resources." Granted, this endeavor is not ordinarily considered to be the principal concern of reference librarians, if their responsibility continues to be that of assisting readers in using the resources that have been amassed and organized by many hands. But as we read the text of the Act under this heading we find that appropriations are authorized therein to enable the Commissioner of Education to "transfer funds to the Librarian of Congress for the purpose of (1) acquiring, so far as possible, all library materials currently published throughout the world which are of value to scholarship; and (2) providing catalog information for these materials promptly after receipt, and distributing bibliographic information by printed cards and by other means, and enabling the Library of Congress to use for exchange and other purposes such of these materials as are not needed for its own collections."

To reference librarians, this statement of intent in our federal statutes is full of promise. To acquire (so far as possible) "all library materials currently published throughout the world which are of value to scholarship" is an amazing objective in this age of exploding knowledge. We have, in these post-World-War-II years, been adjusting ourselves to the fact that no single library, no matter what its resources and skills, can attempt a real measure of completeness in all the fields in which it professes interest. How far toward such a goal the provision of federal funds might be able to carry the Library of Congress—acting in the interests of all the research libraries of the nation—has not been calculated, for this is an incalculable matter. But the aim and purpose are noble, and all librarians would have to applaud the intent of the Act.

Awareness of this broad and comprehensive program of acquisitions by the national library should give reference librarians throughout the nation a new sense of confidence in the ability of our libraries jointly to meet the requirements of scholarship in every field.

Even more practical and concrete is the promise of the next subsection of the Act, in which it is specified that the Library of Congress shall be enabled to provide catalog information for these materials—"promptly after receipt"—and to "distribute bibliographic information" by printing catalog cards and other means, so that every library in the nation may thereby share in the benefits of this grandly conceived program of acquisitions.

It is a fact well known to us all that at present the university libraries of the country can obtain Library of Congress catalog cards for only a little more than half of the books they acquire each year. Increasingly they have had to resort to methods of organizing and recording many of their important acquisitions—including many vital foreign imprints—in economical but bibliographically inadequate fashion, in order to make them available for use. Such minimal bibliographical control as the systems of single-entry listing in card catalogs which a number of libraries have adopted have had to be employed in lieu of the fuller cataloging we still believe in but must often forego, even for many of the books which need it most.

Promise, therefore, of a greatly extended program of centralized cataloging, to bring these essential materials of

research under bibliographical control to an extent we had almost ceased to hope for, is important news indeed.

This promise relates directly to the world of today. There is nothing complex about it, and every reference librarian can recognize the proposed measures as being simple extensions of present systems. Greater efficiency in acquiring the materials of research and providing bibliographic information about them to all the research libraries in the nation are logical, natural steps toward a better utilization of our resources.

Not so direct and simple, but more far-reaching in their implications, are the provisions in that other section of the Higher Education Act entitled "Research and Demonstrations Relating to Libraries and the Training of Library Personnel." Here it is specified that the Commissioner of Education is authorized to make grants "for research and demonstration projects relating to the improvement of libraries or the improvement of training in librarianship, including the development of new techniques, systems, and equipment for processing, storing, and distributing information, and for the dissemination of information derived from such research and demonstrations. . . ."

This part of the Act looks to research to help us develop new methods and techniques, new systems and equipment for better organizing information and making it available for use. "Information," I judge, refers not only to the substance and content of scientific and technological knowledge, but to the body of bibliographical information which is the key to all literature and learning.

The potentialities of the library applications of the new technology have been finely described by William Dix in a recent article in *University: A Princeton Quarterly*. "At the national or regional level," he writes, "there will emerge networks which will bring the book resources of the nation under much greater control, providing much greater depth of indexing and subject analysis, available locally through computer-produced book catalogs or through machine-readable tapes or discs. More rapid and efficient dissemination of the product of the basic intellectual operation of cataloging, performed centrally, may come fairly soon. The actual storage of the intellectual content of books in computers and remote facsimile transmission of texts, while of course actually possible now on a small scale, seem to be fairly remote as regular library operations because of their costs."[1]

The promise of the *research and demonstrations* section of the Act is one, therefore, of helping to bring such potentialities closer to realization.

Reference librarians look with anticipation to the development of library catalogs in machine-readable form, stored in memory devices, and capable of printing out selected portions on demand. To achieve such capability, libraries will of course have to work toward the standardization of bibliographical entries, so that information may be adapted to machine uses. Hence the importance of the plan for greater centralization of cataloging in the Library of Congress.

To serve the bedazzling variety of needs that are being created by interdisciplinary programs and area study centers, institutes for special studies, and joint research enterprises that are such important programs in many colleges and universities today, librarians may in many cases need to organize their services according to new patterns. The general reference librarian may give way in some situations to bibliographers or library specialists in a number of fields of interest: specialists who can work closely with scholars in providing information about library resources and in

[1] William S. Dix, "New Challenges to University Libraries," *University: A Princeton Quarterly*, No. 26 (Fall 1965), 14.

developing collections for research and study. To perform such services will require more complete, more detailed bibliographic information about every kind of material for research: ephemeral materials not in book form, magnetic tapes, technical reports, official and non-official documents. Hence, again, the importance of greater, not less, attention to thorough and detailed cataloging and organization of materials.

Most of the new institutes and centers, as Frederick Wagman has observed, are "based on the premise that existing curricular and department organization, like library subject classification, has virtue and should not be abandoned, yet is inadequate to meet current research and instructional needs."[2]

The area studies, Mr. Wagman points out, "have a new orientation, demanding not only a high rate of current acquisition but significant retrospective resources in which the major libraries of the country have always been deficient."[3] And, when the university organizes itself to cope with the problem of acquiring, organizing, and giving service on publications from an area of Africa, or of Asiatic or near Eastern or East European countries, the staff member initially engaged is likely to be "charged with responsibility for selection, acquisition, cataloging, and reference—the last only if students and faculty can find his desk in either the cataloging or acquisitions departments. When additional professional staff can be provided, the functions of book selection and cataloging may be separated, and eventually a staff specialized in reference work may be employed."[4]

To meet the multifarious language needs for dealing with the publications which come in from all the less-familiar areas of the world we can only turn reasonably to programs of centralized acquisitions and cataloging. Federal aid which will make this possible seems our only salvation.

Douglas Bryant has noted that: "As research more and more frequently crosses traditional lines and as scholars work more in groups and become peripatetic both physically and intellectually, libraries must inevitably alter in significant ways if they are to continue to provide the means for teaching and research. The lawyer and the mathematician in a School of Education, the psychiatrist in a Divinity School, and the oceanographer recently become Director of a Center of Population Studies are going to approach their research in ways quite different from those of their colleagues who continue to work within the traditional framework of their subject fields. And their library requirements will be quite different."[5]

In the Higher Education Act's provision for research and demonstration there is promise even in the vexing matter of interlibrary loans, for here are prospects for better bibliographic organization on a truly national basis. Systems for facsimile transmission of material from one library to another, as they are ultimately developed, will need to utilize the best organized and standardized media for published bibliographic information that can be devised, so that both location of material and transmitting it for use by the scholar who needs it can be provided. Our present chaotic procedures for locating and borrowing materials can only be relieved in this day of burgeoning research activity by utilizing new techniques and systems as they become available to us.

Certainly no functions or services of academic libraries will be more thoroughly affected by the fulfillment

[2] Frederick H. Wagman, "The General Research Library and the Area-Studies Programs," *Library Quarterly*, XXXV (October 1965), 345.

[3] *Ibid*, p. 345.

[4] *Ibid*, p. 348.

[5] Douglas W. Bryant, "University Libraries and the Future," *Library Association Record*, LXVIII (January 1966), 7.

of the Higher Education Act's provisions than will those of the reference librarian. We have already glimpsed enough of the bibliographical world of the future to be impressed by the necessity of taking every advantage of the kind of investigation and planning that this Act will make possible. ■■

IMPLICATIONS FOR RESOURCES AND TECHNICAL SERVICES

BY HELEN M. WELCH

IT'S GREAT to be a librarian in 1966, even a technical services librarian! It's respectable, now that libraries are costing the federal government so much. Education —including libraries—and welfare, they tell us, will be second only to national defense in the federal budget during fiscal year 1967.[1]

If you want to be profession-proud, browse in the four volumes which make up the Senate and House committee hearings preceding the passage of Public Law 89-329. The set should be a best-seller for academic librarians. Note the easy acceptance by the Congressmen of the importance of libraries to this country, and consider that this is the result of a steady building process since the first major library bill in 1956. Note the implied and sometimes explicit request to librarians for guidance on what is needed. Note the gratitude expressed by both Chairman Morse and Chairman Green for the introduction by librarian-witnesses of the completely new proposal which became Part C of Title II. And note Senator Morse's appreciative statements on Edmon Low and Germaine Krettek. It's all in the record.

For technical service librarians, Title II, Part C is much the most important part of the Higher Education Act. It has several aspects that lift the heart. First of all, it's so short. Only seventeen lovely lines out of a document of fifty-two pages! Secondly, it establishes centralized cataloging—the thing we've wanted so much that we've even talked of paying for it ourselves! Thirdly, it was inserted in the bill by members of our own profession and was welcomed by the congressional subcommittees working on the bill. It's pleasant to ask for something you need very much, to be granted that thing, and then to be thanked for asking for it.

According to John Cronin, the proposal had its beginnings in a meeting of the RTSD Subcommittee on the National Union Catalog, held at LC in 1963. The committee's request that LC prepare alternative proposals for a centralized cataloging program led eventually to ARL's creative use of the hearings on the Higher Education Act to insert Part C into Title II. The whole process can give us pride in our profession: the subcommittee's request; LC's response to it; the ARL insertion into the hearings; the careful watching of the legislative process, and guidance through it by the ALA Washington office; and LC's masterly planning to implement the Act.

Those of us who work in day-to-day operations, acquiring books and giving them bibliographic addresses in our collections, sometimes feel that the great powerhouse of research libraries which the Association of Research Libraries represents is pretty far removed from our operations, that the head of a large library doesn't recognize the desperate flailing of the arms as we try to keep from going under for the last time in the flood of materials which come to us in ever increasing waves. But it was ARL which set up a Committee on Shared Cataloging and in 1964 voted unanimously to give its highest priority to

[1] "News," *Library Journal*, XCI (March 1, 1966), 1184.

"developing a program for decreasing the amount of original cataloging." And it was Chairman William Dix of the committee who with great skill inserted centralized cataloging into the Act. At the hearings, Chairman Green of the Special Subcommittee on Education of the House Committee on Education and Labor called the proposal "perhaps more significant than any part covered in the bill."[2] Chairman Dix was abetted by other heads of libraries and by Executive Secretary Jim Skipper, whose library career from acquisitions to technical service head to university librarian had familiarized him with the problem and made him see it as a basic one which would have to be solved if libraries were to meet their increasing responsibilities, and who was *determined* that the problem would be solved. (We're not fools. Last Midwinter RTSD made the ARL Executive Secretary an *ex officio* permanent member of its Planning Committee.)

Librarians must see that centralized cataloging is continued beyond the original five years authorized by the Act. First, we must do all we can to make it work and to show better services and savings as a result of it. Second, we must be ready when the ALA Washington office warns us to speak and write to those who will decide its future. Lack of full initial funding for fiscal year 1966 has already reduced the proving period to four years.

LC Implementation Plans

Let me remind you now of the Library of Congress plans to implement centralized cataloging and the acquiring, so far as possible, of "all library materials currently published throughout the world which are of value to scholarship."[3] The main emphasis of the program at the outset is on foreign publications, omitting periodicals and nonbook materials. With these exceptions, LC is attempting to secure all significant titles published with imprint date 1966 and later and all titles listed in 1966 issues of current foreign national bibliographies regardless of imprint date.

Close working arrangements with the publishers of national bibliographies provide early acquisition of new titles, which are delivered by air mail. Acceptance of the bibliographic descriptions in the national bibliographies for descriptive cataloging copy provides swift cataloging of each title. In countries where the book trade is not well organized and there are no national bibliographies, LC is expanding its already existing purchase arrangements, sometimes adding an agent in the field. To insure against loopholes in its acquisition arrangements, LC duplicates orders made by libraries in this country, such as: 1) blanket orders of several libraries with foreign book dealers; 2) Farmington Plan receipts; and 3) all series on continuation order in reporting libraries.

Coordinated acquisition controls, consisting of a depository file of LC catalog cards for current imprints, are sent to cooperating libraries, *i.e.*, all ARL members and other interested libraries, and offer both early distribution of cataloging copy and a means of notifying libraries which titles have already been cataloged. Titles ordered by cooperating libraries and not found in the control file are reported to LC, so that early acquisition and cataloging can be arranged.

Implications of Title II-C

What are the implications of these LC arrangements for technical services? In cooperating libraries all orders for 1966 and later imprints must be searched in

[2] U.S. Congress, House Special Subcommittee on Education of the Committee on Education and Labor, *Higher Education Act, Hearings*, 88 Cong., 1st Sess. (Washington, GPO, 1965), p. 368.

[3] U.S. Congress, *Higher Education Act of 1965*, Public Law 89-329, November 8, 1965, p. 10.

the control file and procedures must include some satisfactory way of reporting to LC those titles not found. The chance of finding most monographs proposed for order—whether foreign or domestic imprints—are excellent, and the bibliographic information on the catalog card is complete, including price and bibliographic citation. Noncooperating libraries can gain the same information in the published *National Union Catalog*. The increasing completeness of this prompt record should greatly reduce the amount of time now spent in bibliographic verification during the order process.

Title II-C benefits all libraries, but, like a tax cut, it benefits the large operation more than the small. Earlier and more inclusive supplying of cataloging copy is, of course, its prime objective, and it is hoped that, in place of the approximately 50 per cent availability of needed catalog copy reported under various studies made last year, eventually more than 90 per cent will be available under the new procedures. The LC cards provided for the depository control file can be used either for card reproduction or for ordering LC cards by number. Although initially this LC catalog copy comes in card form, it may be provided in machine-readable copy later.

Both major cooperative acquisitions projects—the Farmington Plan and the PL 480 Program—will probably be affected by the new program. Farmington Plan participants will continue to receive publications under their assignments but will no longer be responsible for cataloging them. This change will keep the better part and drop the worse, since as the Plan worked out, it sometimes seemed to insure late cataloging of those titles received under it. Participants in the PL 480 Program may be able to reduce their substantial annual contributions for the cooperative cataloging of PL 480 receipts.

With the gradual reduction of cataloging duplication in libraries across the country and the concentration of standard cataloging in the Library of Congress, we can expect a high quality of cataloging, both in relation to materials which present difficulties because of format or language and in relation to fullness of description and added entries.

Standardization

Those who now modify LC catalog cards will have greater need to justify such activity when centralized cataloging is fully implemented. A greater number of hours will be going into this activity than before, and savings for such libraries will be less than for those libraries which accept all elements on the card. When LC cataloging copy is delivered in machine form, even more ingenuity will be required to justify a tailoring of the copy, since it is more costly to change the machine record than to make a modification manually.

Both centralized cataloging and automation, then, are forcing libraries toward standardization. In time the modification of catalog copy to fit local conditions may come to seem as impractical and unwarranted as it would be to tailor subject headings in periodical indexes to bring them closer to local needs. Subject headings used in periodical indexes are accepted as they are received—and gratefully. The prospect of a foreseeable future in which LC will supply machine-readable cataloging copy almost as soon as a title is published makes the locally tailored catalog seem an indefensible luxury, particularly when, in the far distant future, the great collections at the Library of Congress are open to inspection through on-line computer access, and the advantage is apparent of being able to approach both the home collection and the LC collection through the same avenues.

Acquisition-Cataloging Balance

The new LC acquisition-cataloging program under Title II-C invites those libraries which have not achieved a balanced acquisition-cataloging program, *i.e.*, one in which each year's acquisitions are processed for use during the year of receipt, to make again the effort to put the year's program on balance and to move toward reducing arrearages. The goal is to subdue bibliographically all the publications which the library needs and can afford to acquire. In general, those libraries which have solved the problem have done so by being content with modest collections. Those which have not solved the problem have generally tried to build substantial collections and have created cataloging backlogs. The latter practice of taking collections while they are available and hoping to catch up one day might be said to have been reduced to an absurdity by one university library which last year spent close to four million dollars on its acquisition program, of which less than 1 per cent went for binding, compared to the average 10 per cent binding expenditure in the libraries listed in the ARL "Academic Library Statistics." The same library spent 20 per cent of its total operating budget for staff salaries and wages compared to an average 57 per cent for all libraries reporting.

With centralized cataloging opening up the possibility of processing so many more titles, a balanced operation with a respectable acquisition program begins to seem possible. More extensive use of standing orders for current publications offers dividends in decreased processing costs. Blanket order titles arriving in the library with no records yet made can be matched with the catalog card in the control file, cards can be reproduced within the library, and volumes marked for the shelves with none of the intermediate records which add to processing expenses but which in the end produce nothing of permanent value for the collection.

Serials

The forgotten people in all of this, as in the past, are the serials librarians, particularly the serials catalogers. The Library of Congress does not catalog new periodical titles until the first volume is complete. In addition, LC has considerable arrearages among its serials awaiting cataloging. The decision to omit periodical titles from the initial stages of centralized cataloging was a practical one, but it seems to put the serials librarians and users even further from the Promised Land. Whether a proposed proofsheet service, including all titles listed in *New Serial Titles* with LC classification numbers provided, can give serials operations some relief is yet to be seen.

Resources

Part A of Title II, directed toward increasing college library resources, is commendably broad in its interpretation of "library materials." For small college libraries, the basic grant of $5,000 may represent a significant increase in book budget, and supplemental grants to fill demonstrated special needs for additional library resources may be even more significant. For libraries already large and well supported, the $5,000 basic grant and supplemental grants are most welcome, and the assistance to smaller libraries might also be thought of as aiding large libraries by reducing requests for interlibrary loans and photographic reproductions. Actually, I suspect that the more resources a small collection offers, the more titles scholars can identify to request.

The special purpose grants of Title II and funds provided in Title III to strengthen developing institutions both point toward interinstitutional projects,

either the consortium to develop common programs, or the partnership of an established and a developing institution, to offer a helping hand. In the area of resources, such cooperative programs not only stretch library funds, but also stretch the dwindling supply of older books in the open market.

Perhaps the greatest boost in resources growing out of the Higher Education Act will be the aid to libraries in catching up with their cataloging backlogs and thus making bibliographically available those resources which are presently hidden.

Demonstrations

Part B of Title II offers the possibility of providing demonstrations of well-planned technical services departments employing the best available tooling, a project which RTSD Executive Secretary Elizabeth Rodell has been advocating for some time. For the host library of such a project, able to create a model operation with adequate financial resources, how exciting an opportunity! For the questioning technical service librarian, how useful to be able to see in operation well-designed and well-equipped procedures! Some libraries have been asked to assume a large portion of the burden of entertaining visitors with no regular outside support.

Staff Shortages

In the matter of available staff to process our collections, the Act offers several vectors pulling in different directions. We can hope they will add up to a state of equilibrium. Title II-B aids in training more librarians; Title II-C, by offering centralized cataloging, reduces the number of catalogers needed across the country; Title II-A, with its funds to increase library purchasing power, implies increased needs for processing personnel; and the Act as a whole, with its splendid infusion of energy into higher education, suggests more bodies moving busily among the book trucks, the bibliographies, the catalogs, and/or the magnetic tapes.

International Implications

The Library of Congress, in its excellent plans to carry out the intent of Title II-C, has pointed out the bridge it offers to greater international cooperation in cataloging. LC proposes, you will remember, to use for cataloging purposes the descriptions offered by the national bibliographies of practically all European countries. Only the form and choice of main and secondary entries are adjusted.

Too often U.S. foreign programs start with the assumption that our way is best, and cooperation means that the foreign country changes to conform to our way. The LC report, following its close scrutiny of the national bibliographies, showed that the title description used in national bibliographies is equivalent to or fuller than the present LC standard as established in the *LC Rules for Descriptive Cataloging*. Recognition of the good bibliographic standards of other countries and acceptance of the work produced under those standards offers a long stride toward international cooperation in cataloging.

Thus the suggestion of an anonymous Englishman, made in 1876, even before Ralph Ellsworth's efforts in the forties to centralize cataloging, may now be taken up. Edward Holley reports in his forthcoming book on the organizational meeting of the American Library Association in 1876 that an ex-librarian writing anonymously in *The Academy* (London) on March 18, 1876, observed:

> When I was a librarian myself, I always wondered at the extraordinary waste of power in cataloguing new books. While I was writing my slip, according to the rules followed in most English libraries, I felt that there were probably a hundred people doing exactly the same work which I was doing, not only in England, but in every civilised country of the world. Yet what would be easier than to have

my slip printed, and any number of copies sent round by book-post to every library in Europe. With a little arrangement, every English book might be catalogued at the British Museum, every French book at the Bibliothèque Nationale, every German book at the Royal Library at Berlin, every Russian book at St. Petersburg, &c. At a trifling expense these printed slips might be sent to every small or large library, and each of them might have three or four kinds of catalogues—an alphabetical catalogue of the authors, a chronological catalogue, a local catalogue, a catalogue classified according to subjects, &c. Even when a library is too poor to buy a book, the slip might be useful in its catalogue. The saving that might thus be effected would be very considerable. The staff of librarians might be greatly reduced, and the enormous expense now incurred for catalogues, and mostly imperfect catalogues, would dwindle down to a mere nothing.

Perhaps one hundred years later, in 1976, the anonymous ex-librarian's rational suggestion may well be a reality. ■■

FROM THE POINT OF VIEW OF LIBRARY ADMINISTRATION

BY CHARLES F. GOSNELL

ALTHOUGH I have not been asked to be brief, my remarks will be. Anything that brings in new and usable money—to an administrator—is certainly good.

The implication of my assignment, given months ago, was that there were or would be many problems to which we should give deep thought and attention. My paper was to be submitted many months ago, so that day after tomorrow, you might read again what you hear here today. I objected to that time schedule for two reasons. One was that things might happen between the deadline for the paper and today. I did not want to be in the position of throwing overboard what had been written months ago, and what would be published next week, for something really worthwhile today. As you all know we did get the money like lightning, just two weeks ago.

The administrator is supposed to be a problem solver. Last March, as far as I was concerned, the only problem was that we did not have any problems. There was a law, but there was no money, no rules and regulations, no blanks to fill out. I felt like an MS student at Columbia library school of years ago, trying to get a thesis subject approved. The problem was to find a good problem. My only problem was to explain to my President why we were not doing anything—no money.

It is characteristic nowadays for the federal government to take off with grandiose plans, to pass ambitious enabling legislation—to please everybody—and then fail to provide any money. What problem we had was a political one. It was handled admirably by our ALA Washington office and by our college and university presidents.

By now you may suspect that I had some skepticism about this program. I did. I still do, but not as much. It got off to a good start in the best bureaucratic fashion, there were regional meetings to explain everything to everybody. Of course the real details could not be explained, because there were none. And nobody knew when, if ever, there would be any money.

When it began to look as though we might get the five thousand dollar basic grant, I ventured the opinion that it might take some $5,000 in administrative time and effort to gather data, fill out forms, etc., to get the $5,000. That often happens, particularly in a large and efficient organization. But I was wrong.

We studied the provisions of the law, and tried to guess what we would have to do. Fortunately, we did not work too hard at it.

On May 13 the President signed the supplemental appropriation bill. Within two weeks we had the application forms. Miraculously these forms were unusually simple.

A few names and addresses were asked for, a few boxes to be checked, and eight simple financial figures which any well administered library should have on hand anyway. The form was quickly filled in (seven copies, to be sure) and within another two weeks the approval came. What could be simpler?

Paxton Price and his associates deserve a hearty, "Well done!"

I objected to an assignment which implied that I should indulge in prophecy and pontification, rather than comment on real facts and definite situations, but now I shall proceed to do the armchair bit. I am in the position of the fellow who began by saying, "Before I begin my speech I have something important to say." I have said it, and now I shall take off into the wild blue yonder.

Getting money from the federal government has become a profession in itself. Washington is full of experts, who, for a fat fee, will help you get federal money. The federal bureaucracy has created conditions where these experts can flourish. The basic fallacy is that the government tries to treat everybody exactly alike. There is almost infinite accountability. But no two people or institutions are exactly alike. The professionals are the people who can take unlikes and make them look like the very model which the legislators had in mind. They take rugged individuals and dress them in plausible uniforms to qualify for the handouts.

Soon after the Higher Education Act of 1965 was passed and the regional meetings were held, New York University took formal administrative action and designated its director of libraries to be coordinator of the university by program for Title II. Other coordinators were appointed for other sections corresponding to their respective official concerns. This only demonstrates that NYU is an old hand at getting federal money, and has an effective operating procedure. On December 15 the director of libraries made a report to the Administrative Council of the university outlining the legislation, its background, and its purpose.

Being an administrator he immediately began to try to figure out how much money would be available and when. Under maximum terms NYU might hope to get as much as a quarter-million dollars; so far, we have received ten thousand.

We do not have a library school and I cannot presume to speak on that aspect.

Spending the basic grant, for a large institution, even in a hurry, is no problem. Spending the quarter million will take a little more effort—and we will have to wait for the appropriation and the guidelines.

For the very small institutions the basic grant may be a relatively large sum, and may even involve difficulty in matching. But with a little planning ahead, this should not be a serious problem.

For large and small alike any help to the Library of Congress for centralized cataloging should be no problem, but a great benefit.

On its face, section 203, "Supplemental Grants" does not look too difficult, especially if the guidelines follow the path marked in May 1966.

Section 204, "Special Purpose Grants" looks more tricky, and I hesitate to let my imagination run wild to conjure up the flights of fancy that might be proposed as eligible for "Special Purpose Grants."

Section 205 provides for an advisory council to advise the commission on supplemental and special purpose grants. This seems to be a very good idea. At this time there has been no appropria-

tion for these purposes, and I have no information that the committee has been appointed.

Section 206 provides for nonaccredited institutions on a provisional basis. This is in line with what seems to be the underlying philosophy of the Act, "a little something for everybody."

Section 207 bars use of grants to buy material for religious purposes.

Section 208 represents a passing nod to the agencies responsible for higher education in the several states.

This administrator concludes that so far, at least, the Act has posed no serious problems. Some of the later sections will necessarily be a little more difficult to handle, and may contain "sleepers." More generous appropriations are needed to make the Act really effective. A continuation of the present policy of the Department of Health, Education and Welfare will certainly be welcome. ■■

GUIDELINES FOR THE PREPARATION OF GRANT REQUESTS, AND IMPLICATIONS FOR LIBRARY EDUCATION AND ALA DIVISIONS

BY MAURICE F. TAUBER

WHEN Miss Brown wrote to me some time ago, she told me that my responsibility was to summarize the other papers that would be presented by Miss Krettek, Dr. Gosnell, Mr. Moore, and Miss Welch. I was to single out those areas of concern that our membership should be aware of, if the greatest advantages are to be made of the sections of the Higher Education Act (Public Law 89-329), affecting libraries. This did not seem to be an impossible assignment, unless the participants failed to write papers. I did not think there would be any trouble from this angle. I was wrong in at least one instance, and in another I received the paper Monday afternoon. Dr. Gosnell has indicated the reason why he delayed writing his paper. I think he thought if he waited long enough he might not have to write it at all.

My assignment, however, when the first supplement of *College and Research Libraries* appeared in May listing the program, had been enlarged to the following: "Guidelines for the Preparation of Grant Requests, Including a Summary of the Working Papers (those presented to you), Implications for Library Education, and Recommendations for Future ALA Divisional Activities." Thus, I have a wide range of targets, and if I miss any or all of them it is not because I have not been given the chance to shoot. Within the framework of some facts, and also some fancy or speculation, I will try to summarize the points made in the papers, suggest guidelines, so far as I can, for the preparation of grant requests, discuss library education and research, and to indicate general implications for ACRL and other ALA divisions.

BACKGROUND AND ADMINISTRATION

The points made by Miss Krettek, as always, are to be the heart of the matter. The Act has been described, and the extent of the potential aid to libraries analyzed. Miss Krettek and Mr. Low, too, must be praised again and again for the wording of the statements regarding the library assistance, because it is quite obvious that librarians have been given every opportunity to utilize the available funds in direct relation to their problems. Both of them, I understand, had much to do with the eventual wording. The various librarians who have gone to Washington to support the legislation should also be thanked for their aid.

The actual relationship of the sections of the Act to administration, reference services, and the technical services, as well as to personnel and training, has been spelled out in the several comments of the preceding speakers. Points may be made on some of these comments.

Dr. Gosnell has directed his attention to the fact that the library (and library school, too) will need to have considerable organization of talent familiar with governmental procedure if the institution is to obtain the funds desired for a particular project. Know-how and ability to follow through are implicit, and anyone familiar with a government contract realizes that the operations may be tedious in some situations. Dr. Gosnell has indicated that in this case, however, there has been an effort to make applications for funds simple, and it is hoped that this simplicity will speed up decisions by review groups so that the funds will be quickly forthcoming and applied to the projects outlined. As a matter of fact, our Office of Education has done a remarkable job in their speed, and has caught some libraries and library schools unprepared. At New York University the administration decided that the library would be the coordinator of the matters relating to the Act. This is a satisfactory pattern in an institution which has had a decentralized policy in regard to such requests. In some institutions, it may be somewhat more complex, particularly if there is a centralized control. Whatever the pattern is, however, it is quite clear that there is an essential series of steps, related to many forms that are to be filled out, and records kept, for any funds provided for programs under the Act.

Mr. Moore, as a reference librarian, has singled out those aspects of the Act which may have implications for the reference services of libraries. He has called attention to the development of resources, and the introduction of procedures to make these resources bibliographically available on a wider scale than most of us dared hope for in recent years. Those of you who attended the University Libraries Section of ACRL–RTSD joint meeting Monday evening will recall the observations made by the various speakers on the potential for developing collections at the Library of Congress and for cataloging them quickly for library use. Mr. Skipper particularly pointed out that there appeared to be no limit to the opportunity, if the personnel were available for the task. This was also supported by Mr. Cronin in his remarks. Mr. Moore could not avoid emphasizing the need for sufficient and qualified personnel, as it is obvious that funds available could not be properly expanded unless staff could handle the obligations that the funds bring. Shortage of personnel, of course, is coupled naturally with inadequacies in operations, equipment, and technology. The need for research in technique, systems analysis, and national outlook are therefore cited. An important point, to which I will refer later, made by Mr. Moore is to the promise of research and demonstration.

Miss Welch, of course, had a wide opportunity in regard to the implications for technical services. The Act is quite broad in respect to this field of librarianship, and her comments on centralized cataloging, the Library of Congress potential, cooperative acquisitional programs, standardization, automation, serials, resources, personnel shortages, demonstrations, and international implications do not need to be repeated here. It may be said that they interweave with the comments by Mr. Moore, and give strength to the observation that the reference services are supported by effective technical services.

It is important to recognize a most significant ingredient in the acquisi-

tions aspect of the Higher Education Act. Resources in libraries have been developed by librarians but only in concert with bookdealers and other individuals concerned with the production of books such as publishers of all kinds and now, especially, reprint publishers. The markets for books are expanding rapidly, and stocks of older works are diminishing. Bookdealers and publishers all over the world will be put upon not only by the Act in terms of both acquisitions and cataloging but also by the greater demands which new or embryonic libraries will place upon them. The importance of streamlining acquisitions operations to help bookdealers is obvious. The effectiveness, energy, and interest of bookdealers in carrying out the implications of the Act are obviously of paramount importance. Fortunately, American bookdealers as a group have been friends of American libraries, and I feel certain that they will accept (they are even already in the middle of it, including wholesalers and general trade book sellers) the pressures that are involved in helping libraries develop their collections wisely. I understand that the Library of Congress, in its activities under the Act, is to use Stevens and Brown in London, Stechert-Hafner in Paris, and Harrassowitz in Wiesbaden. Dealers in Scandinavia, Spain, and Latin-America will also be used for this purpose. The Library of Congress has recognized the need for strong personnel in the various parts of the world from which it will seek its literature, and it is obvious that these people will be given full financial and other support to make the job as efficient as possible. In Latin-America the Library of Congress will establish lines of supply similar to those in Europe, and work on the success of the Latin-American Cooperative Acquisition Program (LACAP, as it is called) in its acquisitions program. Publishers similarly will be called upon to reprint many titles which have not been available to small and growing libraries.

Guidelines for Preparing Project Requests

At New York University, if Dr. Gosnell made his point, the procedures for requesting funds are well established. Undoubtedly, this is a pattern in other institutions. At Columbia University, for example, the Office of Contracts and Grants takes an intensive part in the preparing of request applications, and making certain that all elements involved in the request are included. Requests for funds for resources and construction are relatively simple. Requests for research require somewhat more detail. These requests follow a form of presentation, and contain not only a clear-cut delineation of the proposal but also a well-worked-out design, a precise statement of methodology, discussion of any possible built-in evaluative approaches, related studies (if a research project is intended), personnel descriptions, and an extended budget to show how the funds are to be used. Time schedules are always included, and should be marked out as carefully as possible, as many studies have been underestimated in terms of months or years needed. Overhead, of course, is always included, and may be as high as 20 per cent, and if on personnel basis only, as high as 30 per cent.

Indeed, the directions for filling out forms are rather direct and specific. Despite the clarity, however, as has been noted by Miss Krettek and others concerned, the institutions that have no special office for contracts and grants may be at a disadvantage in competition with the larger institutions which specialize in obtaining government funds. One can only say that every institution that is interested in obtaining such help should have staff members trained in developing such requests; if not, they should acquire such personnel by train-

ing individuals to do this work. The various agencies, such as the American Council on Education, for example, have issued bulletins to help institutions, and the April issue of *Special Report on Federal Programs,* of the American Council on Education, is entitled, "The College Equipment Grant Program," which discussed Title VI of the Higher Education Act, which is "to improve the quality of the classroom."

Although we have in library service Miss Krettek's excellent reporting on what is going on in Washington, and how to take advantage of developments in legislation that affect libraries, it may be said that in education there appears to be a more direct assembling of related activities in this publication. Perhaps this is something that may be done by ALA for the smaller libraries, or the individual librarian who may not be aware of the developments and procedures. Indeed, it may not be too late to issue as quickly as possible a handbook for preparing project requests for government awards and contracts. Titles I, IV, VI mentioned by Miss Krettek are examples of an area that might be included.

Individual institutional requests for awards relating to building construction, teaching awards, or demonstrations of various kinds follow a pattern that has been related to forms and instructions for filling them out. As a reviewer for the Office of Education, and as a consultant in research proposals, I have seen many of these as they come in for examination and decision. The ones that receive high priority follow the stipulations set forth, and make sure that no single element in the series of requirements is omitted.

At this point, it may be worthwhile to refer to the general program of research and demonstration that the Office of Education is concerned with in Title II of the Higher Education Act. At a meeting of various individuals (librarians, library school educators, and representatives of library associations) in Washington in March 1966, which I was given the privilege to attend, there was a discussion of (1) Title II with emphasis on library research, (2) the provisions of Title II, Part B, and plans for program administration, (3) considerations that are required for implementation of the program, (4) policy decisions that are related to making the program most effective, (5) considerations of writing of the guidelines for library research programs, and (6) developments of priorities in research, and specification of research criteria.

At this meeting, which was directed by Lee Burchinal, who is acting director of the division for research training and dissemination of the Office of Education, it may be said that the effort has been so to structure the program as to make it easy to submit proposals. The review of Title II, Part B, particularly Section 223, dealing with grants for training in librarianship, and Section 224, concerned with research and demonstrations relating to libraries and the training of library personnel, and specification of review criteria was particularly useful to all members present.

The following comments may be made about this meeting that are relevant to the progress of the relation of libraries and library schools to the Higher Education Act. It was pointed out that there would be $103 million for research for education generally, and that part of the total allotted to library service could be applied on every level from elementary education to post-graduate training.

The character of the program in research is worth special comment, as some of you may not be familiar with the types of programs that are available. They are as follows:

1. *Small grant program.* This program includes studies with a grant of from $7,500 (minimum usually) to $9,000, which would be primarily on an eighteen-month basis, and which may

be more useful even on a shorter period. These grants would be of the kind that might be particularly applicable to doctoral students in library schools.

2. *Regular projects.* These are those projects that may be carried on over a period of two to three years, and would go up to several more thousands of dollars over the small grant projects, if such funds are necessary.
3. *Program support.* This concept is directed to the support of an individual who has demonstrated capacity and has issued reports that relate directly to proposals. On the basis of past achievement, grants are given to such individuals for exploration of given areas. There is no set limit for funds, although there is tendency to limit grants to the periods involved.
4. *Research and development program.* This type of program involves the establishment of nine centers throughout the country, and would require interested institutions to match funds and make a substantial investment in carrying out the project. Large scale library projects are possible here.
5. *Regional laboratory program.* This is the largest effort applied to educational research, and is supported up to the needs of the project, and within the framework of the funds available to the Office of Education. It is not likely that libraries will be involved but it also is not impossible in terms of a major cooperative project.

At our meeting, the process for reviewing proposals was discussed in some detail. It was indicated that in the past some time would elapse between the submission of a proposal, and the decision on it. It was estimated at that time that it would be about three months. It was hoped that this would be reduced to eight weeks. This period would depend on the cooperation of consultants and readers in the field.

The group made an effort to list areas of present concern, and to indicate the relationship of the U.S. Office of Education projects being received to those being considered by ALA (Library Technology Program with its Office of Research and Development), National Science Foundation, Air Force Office of Research and Development, National Institutes of Health and various other separate agencies of the government including major national libraries (Library of Congress, National Library of Medicine, National Library of Agriculture), and the new committee on Science and Technology located at the National Academy of Science (F. J. Weyle, executive director); this was an outgrowth of the work of Committee on Science and Technical Information (COSATI). It was also pointed out that ERIC (Educational Information Research Center), established at the Office of Education, with related centers distributed at other institutions, would be in a position to coordinate research activities, and to eliminate overlapping or duplicate research.

It was apparent that any research program in librarianship would need to examine priorities in the field. After various plans or analysis of the field, the following rubrics appeared to represent a consensus of the group:

1. Values of librarianship, including studies of users, uses, goals of services, and social utility.
2. Intellectual problems, involving bibliographic control, cataloging, classification, indexing, abstracting, and data processing and retrieval.
3. Systems analysis and planning, including allocation of resources, national responsibilities, and placement of men and machines.
4. Operations, involving mechanization, accounting, access to materials, and utilization of manpower.
5. Social and professional issues, including education of librarians, librianship as a profession, and the pro-

gressive development of various types of libraries.

6. Resources and preservation, including the building of collections on a national basis, and caring for them in ways that we have not done in the past.

These areas are not new; they have been discussed in the literature of library service generally, as well as in library education. Verner Clapp includes them in his "Problems for Research" in *The Future of the Research Library,* issued last year by the University of Illinois.

Implications for Library Education

The preceding comments are directed at the problem of education for librarianship. I need not dwell on shortages in various areas of library service (and especially the serious gap in providing cataloging personnel, and personnel with some knowledge of automation). The development of new library schools in all parts of the country has raised the additional problem of staffing with teaching personnel. The Higher Education Act is concerned with developing personnel in these areas.

The need to inform all library schools of the implications of the Act is the basis for this meeting this morning, if any needed such information. The issuance of reports and papers on the Act, however, might be supplanted by the brochure suggested earlier, which would also include an explanation to all those in library education, of opportunities under various parts of the Act and related Acts. Miss Krettek has been trying to do this, and has done a remarkable piece of work, but the issuance of such an analytical bulletin, with instructions for procedure, might be of especial help to those libraries or institutions where there is not a mighty contracts and grants office.

In all library schools of any size, there should be an interest in obtaining funds available for improvement of the teaching personnel in the profession; announcements of advanced and doctoral study were made in May 1966. A large number of schools have been awarded grants for either advanced study or doctoral programs, with the expectation that many of these people (and it is going to be rough to recruit suitable personnel) will go into teaching.

The $3,550,000 available for research should be the basis for needed studies in the field as outlined earlier. There is a wide range of projects possible, as outlined in Section 225 of the Act, involving all levels of library service, and in all areas, including demonstrations, which would involve libraries themselves. This means that libraries, apart from individuals or library schools, can submit proposals separately, or in conjunction with library schools. The pattern of applications is quite flexible.

It is also quite clear, particularly after attending the meeting here of the Association of Hospital and Institutional Libraries division on Monday morning, that Section 223 (which is administered by another unit of the Office of Education, the Research Training Branch) should be coordinated with the Medical Library Assistance Act (which is supported by the Public Health Service) in terms of recruiting and training of personnel. The existence of this latter activity may be well known to medical librarians, but is not generally known to librarians as a group.

The implications for library education for individual schools of library service are quite clear. If library schools have not made proposals for obtaining funds for specific projects, they should do so. The various committees in library schools concerned with recruiting of students, and fellowships for advanced study, doctoral programs and research, or other relevant activities, should be involved in such proposals. Any projects of course imply that the schools are in a position, on the basis of personnel, facilities, and

equipment to perform on a high level if grants are awarded. All of us have a responsibility of not asking for funds if they cannot be used effectively. I am told that some of the nonaccredited schools or educational agencies are concerned about grants that have been given only to accredited schools. I am sure that eligible nonaccredited institutions are in a position to obtain grants and do effective work in the areas outlined. The law provides for criteria for selection and it is expected that some schools not now accredited will thereby improve their status and become eligible for accreditation. Title VI of the Higher Education Act (Public Law 89-329) established a new program of federal grants to institutions of higher education for the acquisition of laboratory and other special teaching equipment, or audiovisual materials. Miss Krettek has pointed out that this Act included libraries among the areas that might be assisted. The Act in general is intended to help those institutions that are making an effort to improve themselves.

Other Divisions of ALA

My assignment was to point out the implications for the various divisions of ALA. Mr. Moore and Miss Welch have done a complete job in describing relevant implications for the reference services and technical services respectively. In its various sections, the Higher Education Act cuts across all divisions of the association, and it would seem that each unit of the ALA should be concerned about obtaining as much assistance as it can in the months ahead, to further its specific program. This does mean that there probably should be committees or groups representing the individual divisions of ALA. They probably should be coordinated at some point, so that overlap and duplicative projects would be minimal or non-existent. The Reference Services Division, the Association of College and Research Libraries, the Resources and Technical Services Division, the Library Administration Division, the Public Library Association, the Library Education Division, and the various other divisions—the Children's Services Division, the American Association of School Libraries, the Adult Services Division, and any other division of the ALA concerned with training of personnel (and all of them are), facilities, and services—are apparently able to qualify for participation in one or more of the several sections of the Act. We need to read the Act carefully, so that implications or possibilities are not overlooked. The Act, as I indicated earlier, has been written so that libraries can be helped to the utmost, if they take advantage of the opportunity. In addition to Miss Krettek, who has worked so tremendously at getting the act through, one might not overlook our legislative general, who has come through the wars with great success—our moderator, Edmon Low.

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JOSEPH C. SHIPMAN

"Optimum Size" and the Large Science Research Library

Techniques for developing optimal size are more meaningful today than they were twenty years ago. Weeding, selective microfilming, and dependence upon neighboring libraries are still useful, but the general framework has radically changed. Exponential curves of growth in research, and in the literature reflecting this research, as well as appearance of entirely new subject areas and proliferation of older disciplines, have produced a new environment. Perhaps the chief emphasis should shift from the old concern about optimal size to exploration of new devices such as establishment of information centers on the Weinberg model and participation by all special libraries in new networks of scientific communication.

WHILE "OPTIMUM SIZE" has long been a concern of special libraries and of large library divisions and departments with special missions, it was probably less meaningful and less critical in the past than it is today, in the face of an ever-mounting flood of scientific and technical publication. National resource libraries, university libraries, and other large research libraries now look ahead ten or twenty years, and predict expenditures of tens of millions and hundreds of millions of dollars for collections, for services, for automation, and for staff. The collection and storage of scientific and technical literature obviously is necessary, but one collection could not provide adequate service, and duplicate collections in every scientific and technical institution obviously are not economically feasible. Since such a procedure is out of the question, each technical library, and all scientific and technical libraries collectively, face unprecedented problems not only in establishing criteria for optimum size, but also in determining what is of value, and what is economically feasible.

What is the scale of the problem? Contrary to the popular impression that the spectacular burgeoning of scientific research and of publication is a post-war phenomenon, Derek J. de Solla Price points out[1] that the now-familiar exponential curve of growth had its origins in the seventeenth century, and that, since that time, there has been an annual literature growth of 7 per cent compounded. This works out to growth by a factor of 10 each half-century, and by a factor of one million in the three centuries which separate us this year from the first issue of the *Philosophical Transactions* of the Royal Society.

Since, quite obviously, scientists produce science and its literature, it is important to consider some of the facts about these producers. Most of the scientists who have ever lived are active

Dr. Shipman is Director of the Linda Hall library in Kansas City, Missouri. *This paper was read at the 1965 annual meeting of the American Society for Engineering Education in Chicago.*

[1] D. J. de Solla Price, "The Scientific Foundations of Science Policy," *Nature*, CCVI (April 17, 1965), 233-38.

and working today, and indeed, perhaps 50 per cent of them have been produced in the past ten years. This is not a new feature in the scientific scene but has been true throughout the previous centuries of modern science. Newton, Faraday, Darwin, Rutherford, and Einstein could say that most of the scientists produced up until their own times were to be numbered among their working colleagues, and that most of them were young. For those of us working with the scientific literature this is significant, because the one distinguishing characteristic of all scientists is that they publish. Publication was and is the lifeblood of science. It has been throughout the past three centuries the prime vehicle of communication, of dissemination, and ultimately, of storage for all scientific knowledge. It was more than that, for as Weinberg has said, "throughout the years the scientific community has developed an empirical method for establishing scientific priorities—deciding what is important in science, and what is not important. This is the scientific literature. . . . The process of self-criticism embodied in the literature, though implicit, is nonetheless real and highly significant."[2]

Science is a cumulative discipline, and therefore, as Newton observed, in all modesty every creative worker stands on the shoulders of the giants who went before. Today, as Gerald J. Holton of Harvard University said recently, it is more likely that the producing scientist sits in conferences side-by-side with the giants on whose shoulders they stand. Perhaps they are not all giants, but their shoulders still support an immense effort in some of the rapidly growing subject areas. The scientific paper has generally been the accepted vehicle of communication in this process of cumulation, and as Weinberg has suggested, an effective agent in the selection and critical evaluation of the material to be communicated, disseminated, and stored. Both of these historical functions seem to be in serious jeopardy today.

In the case of communication, how can the million or more articles appearing every year reach more than a tiny fraction of their potential audience? How many people, except for the author, the referees, and the editor, ever read a significant number of these papers? As to dissemination—which can be defined in this context as controlled or directed distribution of the literature to a particular audience, prepared and able to understand it and use it—how can such dissemination possibly be effective in view of the proliferation of the literature, the language barriers, and interdisciplinary complications? While some of the communication and dissemination function has shifted to secondary sources—to the abstracts and the current reviews—these secondary publications have themselves become infected with the virus and in many cases are now so voluminous, so frustrating to use, that they too fail—at least in terms of communication. As a result we now see the phenomenon of the mushrooming published symposia, congresses, and conferences, and colloquia, indicating that scientists may be returning to the old "invisible college" idea, in which personal contact becomes once again the primary device for communication within a fairly close-knit group of specialists. The best of these conference and symposium publications —because they have been presented to a knowledgeable group of peers—have the advantage of built-in critical evaluation. The ideas presented have been criticized and the criticisms embodied in the published summaries or proceedings.

In terms of this selective and critical evaluation of the literature, the proliferation taking place has generally reduced its reliability and effectiveness. For one thing, the wide variety of sponsorship of current publications—journals and serials published by scientific societies,

[2] Alvin M. Weinberg, "Criteria for Scientific Choice," *Minerva*, I (Winter 1963), 159-71.

or by commercial organizations, or by trade groups, or by government agencies, etc., has resulted in a lack of uniformity or consistency in refereeing, and in critical appraisal. The report literature, now widely dispersed throughout the bibliographic retrieval systems, has sometimes added only bulk—uncritical and nonrefereed papers in great numbers—to still further complicate the picture.

Then, too, there is the Tower of Babel problem. As one nation after another qualifies for membership in the select society of science and technology, new and generally unfamiliar languages (at least in the West), such as Russian, Japanese, and Chinese, appear ever more frequently and, for example in a field such as chemistry, make up more than 50 per cent of the current publications indexed and abstracted in this subject area. In a special abstracting tool, one issue of which I had occasion to consult recently, contained a total of 373 references, 148 of them in Russian, 140 in English and 85 references distributed among eleven other languages.

In spite of all this, I would agree with Ralph Shaw that "our problem does not appear to be one of too much literature. It would be criminally wasteful if the vastly increased research expenditures of recent years did not result in vast (though not proportional) increases in knowledge, and it would be equally wasteful if the new knowledge thus created were not made permanently and generally available."[3] Our research expenditures have doubled on the average every four years since World War II, going from one billion to about eighteen billion dollars in 1965.

Nor can we challenge the appearance of the new or even the exotic languages in the sciences. As Dr. Price has emphasized, the exponential feature of growth in the literature involves differing rates of growth for particular subjects and particular countries at different times. There is some evidence to indicate that, relatively speaking, American, British, and Soviet rates of doubling are slowing down, and that other nations are taking up the slack with an increased acceleration. The results for the early future are then quite obvious in terms of the resulting language distribution in the literature. One English scientist predicted some years ago that by the end of this century more than 50 per cent of the world's scientific literature could be in Chinese.

For the large research library therefore it seems hardly realistic to talk about optimum size techniques without careful consideration of the corrections and adjustments which are called for, and indeed may be already at work within the basic framework of scientific and technical communication.

"Optimum size" has of course always been a relative expression, and the devices used in its pursuit have recognized differences between libraries in size and in function; differences in mission, as well as the increasing interdisciplinary fluidity which has disrupted many a carefully laid scheme for subject coverage and control.

In the past many devices have been used in determination of optimum size. They have included, among others, the following:

1. The establishment of restrictive limits of subject selection.
2. The use of literature citation counts for determining most-used serial titles, as well as for most-used foreign language titles and for the required and desirable time coverage in the acquisition of backfiles.
3. Dependence upon neighboring libraries for particular areas of subject strength, and for breadth of coverage.
4. Extensive use of interlibrary loan to tap more distant library strengths.

[3] Ralph R. Shaw, "The Function of a Modern Special Library," *Research Management*, V (November 1962), 485-92.

5. Discriminating weeding.
6. Selective microfilming, and the systematic purchase of available microforms.

All of these approaches were and still are practicable and manageable, depending upon the particular library's size, function, objectives, and support. For the special library, the problem apparently is still much the same as it was. To quote Ralph Shaw again, "the need in terms of storage and obtaining materials is simply that of housing those things used frequently enough to justify their space . . . and developing a communication system which would produce the desired material from any source in which it was housed as promptly as it was needed . . . the job of the special library is to support the research program for which it is maintained—no more, no less."[4]

The catch is in the phrase "as promptly as it was. . . ." Here we shift back to the large research library, with all of its unsolved problems and complications regarding "optimum size." Shaw feels that it should not be difficult to "develop a network of intelligence services starting with our great research libraries to provide a reservoir of materials; a series of information centers, with bibliographical and substantive competence to bring together the significant materials, and eliminate redundancy in broad areas of science and technology. . . ." Perhaps it is not so difficult as we think, but at a first look it would seem to require a totally new approach to the literature by the scientist himself, rather than a solution by the traditional custodian of the literature—the librarian and the documentalist. The potential network of great research libraries is available, providing the reservoir of materials and the necessary bibliographical competence. The information centers are already growing in number and in effectiveness and are bringing to bear some of the substantive competence which is the crying need in the current literature situation. It is but a rare beginning, and in spite of the challenges raised by Weinberg, Wigener, Bernal, and many others the working scientist generally has not concerned himself with the primary responsibility which would seem to be his in the total process of evaluation and control of scientific communication.

In looking for the patterns which are necessary for adequate control and management of this communication, our problem is not primarily one of a need for new machines. We have the machine capability, and it will play a vital role, but it seems to me, an ancillary role. Without going into the specific questions of this role, it seems to me that computers will make it possible to do all the jobs we need to do, but they will not themselves do the job.

Weinberg has emphasized the importance of one promising development—the emergence of the information center which far transcends our earlier, more limited conceptions of such centers. The new centers will be manned by scientists and by librarians, all dealing with information problems in the broadest sense. Scientists on various levels of the Wigener social hierarchy will try to learn about everything that is published in special fields. They will scrutinize, codify, evaluate, compile, review, and synthesize. Their work will result in published abstracts, bibliographies, compilations of data, compilation of information about instruments, equipment, and techniques. Eventually, on other levels, they will extract, relate and generalize, far more systematically than is done today. The center will handle the difficult questions dealing with its special area of competence—questions which will be referred to it by national, regional, state, and local referral centers—probably located in the libraries representing these

[4] *Ibid.*, p. 488-89.

(Continued on page 392)

DAN BERGEN

Implications of General Systems Theory for Librarianship and Higher Education

Systems science has both theoretical and empirical dimensions. General systems theory investigates the isomorphism of concepts, laws, and models in the various domains of human inquiry. General systems theory has implications for both academic librarianship and the teaching-learning process in higher education. With respect to the former, it promotes the conceptual reorganization of knowledge for storage and retrieval. With regard to the latter, it seeks to identify concepts whose organizing power transcends the artificial bounds of the academic disciplines.

DURING the first quarter of the nineteenth century, American higher education was attacked by those who deplored its theological orthodoxy and smug classicism. In defense of the existing order and in an attempt to define what the American college ought to be, the faculty of Yale College issued its famous (or, depending upon one's point of view, infamous) report of 1828. The goals of liberal education were stated early in the report: "The two great points to be gained in intellectual culture, are the *discipline* and the *furniture* of the mind; expanding its powers and storing it with knowledge."[1] Set in a mid-twentieth-century context, these educational prescriptions do not seem entirely irrelevant despite their defensive posture at the time of enunciation. In the 137 years since the issuance of the report, there has seemed to develop, the countervailing efforts of this century notwithstanding, an imbalance in American higher education in favor of one of its two emphases. Concerned with furnishing student minds with knowledge, mainly knowledge of a low order of abstraction, American institutions of higher education have by and large underemphasized the goal of discipline, that is to say, the task of acquainting students with the means by which the knowledge they have been furnished may be ordered and made meaningful. It is precisely in this realm of discipline, or, put another way, in the imaginative organization of knowledge for transmission from one generation to the next, that the major implications of general systems theory for librarianship and higher education seem to lie. Only to the extent that these implications are realized can Kenneth Boulding's suggestion of a reorientation in educational thinking—from the existing norm of maximum knowledge transmission to a new and more relevant norm of minimum knowledge transmission—be accomplished.[2] It is to that very large

[1] Quoted in Frederick Rudolph, *The American College and University: A History* (New York: Knopf, 1962), p. 132. The Yale Report of 1828 was published as "Original Papers in Relation to a Course of Liberal Education," *The American Journal of Science and Arts*, XV (1829), 297-351. It also appeared in *Reports on the Course of Instruction in Yale College: by a Committee of the Corporation and the Academical Faculty* (New Haven [1828]).

Mr. Bergen is Chairman and Associate Professor, Department of Library Science, University of Mississippi.

[2] See Boulding, *The Image: Knowledge in Life and Society* (Ann Arbor: Univ. of Michigan Pr., 1956), pp. 162-63.

end that this very modest paper seeks to contribute.

The processes underlying the growth of human knowledge are undoubtedly very complex. The very complexity of these processes should not, however, deter a search for pattern and order in them. One way of viewing the growth of knowledge historically is through the alternating dominance of raw empiricism and low order empirical theory on one hand, and speculative philosophy and logically and mathematically informed hypothetico-deductive theory on the other. To interpret the development of knowledge within such a cyclic framework is to see its growth in terms of the dominant strategies employed over time in its generation. For example, the speculative philosophy of the late medieval period can be depicted as hovering above, in its abstractness and formalism, the seeming disorder of the empirical world much like a hovercraft hovers directly above a point on land or water without ever settling on it. The intellectual formulations of the fourteenth century have been characterized as "verbal, logic-chopping, and abstract" as a consequence of their obsession with "discipline, method, and artifice." In contrast, a medieval schoolman reincarnated during the last quarter of the nineteenth century might well have deplored the excessive empiricism of the emergent academic specialties and their emphasis on "subject matter, experience, and nature," not to mention their inclination toward the "factual, pragmatic, and technical."[3]

Peter Caws has interpreted the progression of science as a continuing dialectic or interplay between its logical and experimental aspects, the former involving "the rational investigation of connections between concepts, without special regard to the adequacy of the concepts to experience" and the latter "the empirical investigation of connections between events, without special regard to the significance of these events in any total scheme of things."[4] The relationship between logical construction and empirical investigation in the development of knowledge viewed both holistically and in its man-defined subdivisions seems indeed to be reflected in a mutual feedback which drives the structure of knowledge, over the long term, toward a kind of homeostatic steady state. It has been suggested that the output of empirical knowledge in the various academic disciplines (and therefore, by extension, in knowledge as a whole) is controlled by the differential integrative capacities of those disciplines.[5] Thus it follows that where a discipline's logical or theoretic-deductive component is well developed the production of empirical knowledge will be facilitated. This hypothesis also suggests, at least for the modern intellectual disciplines, that any imbalance between theoretic and empiric dimensions is ultimately corrected by the internal logic of equilibrium. Still, over the short term, the empiric is capable of outrunning the theoretic and vice versa. From the standpoint of organizing knowledge for transmission, the seriousness of theoretical knowledge outdistancing empirical knowledge is not so great as that of empirical investigation outrunning integra-

[3] Richard P. McKeon, "The Liberating Arts and the Humanizing Arts in Education," in Arthur A. Cohen (ed.), *Humanistic Education and Western Civilization: Essays for Robert M. Hutchins* (New York: Holt, Rinehart and Winston, 1964, pp. 169-70. A modern analogue of the postulates of speculative philosophy are the mathematically formulated deductive postulates of theoretical physics which tend to be judged more on a basis of aesthetic excellence than on any criterion of empirical validation. See Peter Caws, *The Philosophy of Science: A Systematic Account* (Princeton, N.J.: Van Nostrand, 1965), pp. 283-84.

[4] Caws, *op. cit.*, p. 331.

[5] See Norman W. Storer and Talcott Parsons, "The Disciplines as a Differentiating Force," in Dan Bergen (ed.), *The Foundations of Access to Knowledge* (Syracuse, N.Y.: School of Library Science, Syracuse University, in Press), (pp. 23-24 in the mimeographed form).

tive capacity.[6] It is this latter type of imbalance that can lead to the crisis of a civilization incapable of meaningfully integrating its knowledge. To counter such imbalance would seem to be a most worthy rationale for general systems theory.

In an anthropomorphic sense, the growth of knowledge may be viewed in evolutionary perspective as a process of progressive differentiation of the total domain of inquiry. Even though philosophy embodied the bulk of human knowledge from the classical Greek period to the eighteenth century, some differentiation could already be observed during medieval times. If the grammar, rhetoric, and logic of the trivium were not strictly subjective matters, the remaining liberal arts of the quadrivium (arithmetic, geometry, astronomy, and music) had the character of nascent academic disciplines.[7] There were also, in the medieval universities, separate faculties of law, theology, and medicine. By the early eighteenth century, philosophy itself had developed two identifiable branches—moral philosophy, which remained largely speculative and normative in character, and natural philosophy, which was scientific mainly in the enumerative or taxonomic sense of that term. The modern scientific disciplines did not evolve out of natural philosophy until well into the nineteenth century. It is widely held, at the present time that the individual disciplines of the physical, biological, and social sciences are distinguished from one another by the different objects and events which they seek to explain.[8] Russell Ackoff has observed, however, that the intellectual disciplines are simply a reflection of man's effort to organize nature and not necessarily therefore reflective of the inherent structure of nature. Academic disciplines, as a consequence, are differentiated less on the basis of unique subject matters than on a determination of their attention to different aspects of reality and by the various ways in which they explain the same phenomena.[9] This distinction is important since it calls into question the existence of a correspondence between the structure of knowledge as embodied in the disciplines, and the structure of nature. This difference will be discussed in greater detail later in the paper when the distinction between conceptual and concrete systems is considered.

It has been intimated above that the development of individual disciplines, indeed the growth of knowledge as a whole, may be viewed cybernetically as the interplay or mutual feedback of theoretical and empirical components. Saul Gorn has conceptualized this process in terms of information storage and retrieval using file growth as an analogy:

> What happens is that there must be a balance, as the file grows, between the retrievability of the information and the needed communication flow of the information; the control of the information due to the structure of its arrangement must balance the method by which it is communicated. What has happened, then, is that the continuum of a domain of knowledge when a revolution is due, either splits into distinct fields or changes phase radically by a change in the structure of its arrangement. That is,

[6] Caws, *op. cit.*, pp. 331-34. Karl W. Deutsch has discerned that the interplay between the empirical-inductive and theoretical-deductive components in science define a continuum along which the different disciplines may be located in terms of the relative importance of these two dimensions within them. See his "Scientific and Humanistic Knowledge in the Growth of Civilization," in Harcourt Brown (ed.), *Science and the Creative Spirit: Essays on the Humanistic Aspects of Science* (Toronto: Univ. of Toronto Pr., 1958), p. 8.

[7] McKeon in Cohen (ed.), *op. cit.*, p. 165.

[8] This is one of the criteria specified by Caws, *op. cit.*, p. 280. This criterion for the differentiation of disciplines is shared by Marc Belth. See his *Education as a Discipline: A Study of the Role of Models in Thinking* (Boston: Allyn and Bacon, 1965), p. 6.

[9] See Russell L. Ackoff, *Scientific Method: Optimizing Applied Research Decisions* (New York: Wiley, 1962), p. 419.

once the mass of information got beyond the critical mass, usually either fission or fusion occurred. Fusion is the change in the structure of the individual science itself to make it a much more compact carrier of information; for example, general laws are highly compact bouillon cubes of information. Fission is the breaking up into various areas of specialization, which we have already mentioned. The fission or fusion occurred in each case because the information got beyond our capacity, and its former control began to require too much time to retrieve. In order to be able to retrieve the information, you either have to have separate specialized lumps or have a violent change in structure.[10]

Viewed macroscopically from the standpoint of knowledge as a whole the discrete disciplines yielded by man-directed fission can be re-fused through the imposition of man-inspired constructs which correlate, in some meaningful way, the empirically validated principles of the various academic disciplines. Viewed microscopically, from the standpoint of a particular discipline, the hegemony of either fission or fusion is dependent in very large measure upon that discipline's stage of development. The thrust of fission is strongest during a discipline's initial or taxonomic stage of growth. This first stage of inquiry, called by F. S. C. Northrop the "natural history" stage, is concerned with classification "whether dealing with pure compounds in chemistry, minerals in geology, species in botany, structures in anatomy, or specific functions in physiology."[11] The second level of a discipline's development is that of empirically-based theory, what Caws has called the nomological stage, after the Greek "nomos" or "law." The Pythagorean Theorem, for example, defined a relationship existing between the sides of all of the right triangles, regardless of size, which were classified as such during the first, or taxonomic, stage of discipline development. In the third and final period of growth, deductive systems based on very broad postulates from which less general propositions can be logically derived are seen to develop. A substantial part of physics has entered this final, often highly mathematical, stage. Chemistry and that part of biology which has a mathematical orientation are moving gradually into it. Since the late nineteenth century, a vast number of deductive systems have come into existence. Providing great impetus to the proliferation of such systems was, of course, the realization by mathematicians of the century just past that the axioms of Euclidean geometry, particularly that which proclaimed that through a point not on a given line only one line could be drawn parallel to the given line, were not self-evident truths or given a priori to the intuition, as Kant and scholars in general had believed for some two thousand years.[12] Other deductive systems in geometry, as a consequence of this discovery, seemed entirely possible and were presented as such. Even this last stage of inquiry, where systems of immense deductive fertility are seen to exist and promote fusion, has its serious limitations. The general faith of mathematical logicians in the viability of axiomatic systems was shaken in the early 1930's by the young Viennese mathematician Kurt Geodel who demonstrated that any consistent system which is strong enough to produce natural numbers and operations

[10] Saul Gorn, "Computers, Communications, and Science–Extending Man's Intellect," in Lowell H. Hattery and Edward M. McCormick (eds.), *Information Retrieval Management* (Detroit: American Data Processing, 1962), p. 126.

[11] R. W. Gerard, "Quantification in Biology," in Harry Woolf (ed.) *Quantification: A History of the Meaning of Measurement in the Natural and Social Sciences* (Indianapolis: Bobbs-Merrill, 1961), p. 210.

[12] While Euclid's axiom still holds for everyday kinds of lines, it is not relevant for Einsteinean space where parallel lines do not exist. See Michael A. Arbib, *Brains, Machines, and Mathematics* (New York: McGraw-Hill, 1964), p. 120.

like addition and multiplication can also contain formulae which are meaningful and true even though they cannot be proved with the system itself. Nevertheless, an academic discipline which has matured to this final stage has made a robust advance. There is a vast difference, as Northrop is wont to point out, between the immediately sensed color "blue" of the natural history stage of inquiry and the conceptual notion of "blue" in the final, or deductively formulated theory, stage of inquiry where that color is defined by its hue (or wavelength), its intensity (or the amount of energy it reflects per square centimeter per second), and its saturation, all of these characteristics deriving their meaning from the system of postulates of which they are a part.[13]

It would be a mistake, however, to view all activities within a particular discipline as being at the same level of development and sophistication. Indeed, in the field of biology the taxonomic activity of the botanist, or entomologist, or zoologist, and the process-oriented studies of the mathematical biologist can prove mutually reinforcing, as the morphogenetic studies of Edmund Sinnott on the relationships between form and function seem to suggest. One authority even suggests that physics, much of which is concerned with deductive systems, has its descriptive and nomological areas. And the social sciences are still, despite efforts to formulate a "social physics," by and large restricted in their activity to the descriptive and nomological levels.[14] Although fission and fusion strategies are capable of coexistence (indeed must coexist in some manner), one will usually be dominant at a given point in a historical time. Gorn, it has been learned, sees either fission or fusion vis-à-vis the body of knowledge as capable of solving the problem of information storage and retrieval. From the vantage of one whose primary concern is with meaning and cohesiveness as the compelling reasons underlying any effort to restructure knowledge the strategy of fusion seems far more promising and imperative.[15]

The fused character of knowledge and its interconnectivity may be seen historically in man's employment of primitive models to explain his largely undifferentiated external reality, and later, after it was decided to organize the continuity of knowledge in fundamentally discontinuous disciplines, his adoption of more sophisticated models which, having their genesis in a particular discipline, proved their analogical suggestiveness by rapidly penetrating other fields, scholars as diverse as the educational philosopher Marc Belth and the political scientist Karl Deutsch have seen in the study of the development and pervasive diffusion of models for organizing reality a principle which might well underlie the educative process. The earliest models by which man sought to explain the universe of phenomena which impinged upon him were, of course, anthropomorphic, that is to say, an ascription of human qualities to the elements and behavior of nature. Later in the course of human history the wheel, the balance, the web of thread (with its implication of interaction), the pump and the clock (with their implication of mechanistic determinism), and the classical organism with its infused teleology or goal structure served as models.[16] Models, as such, vary in character.

[13] F. S. C. Northrop, *The Logic of the Sciences and the Humanities* (New York: Meridian, 1959), pp. 102-104.

[14] Caws, *op. cit.*, pp. 280-81. See also Gerard in Woolf (ed.), *op. cit.*, p. 210.

[15] Sigmund Koch suggests that recent introspection in science, education, and philosophy has reversed the emphasis on an analytico-reductive approach. See his "Psychology and Emerging Conceptions of Knowledge as Unitary," in T. W. Wann (ed.), *Behaviorism and Phenomenology: Contrasting Bases for Modern Psychology* (Chicago: Univ. of Chicago Pr., 1964), pp. 1-4.

[16] Karl W. Deutsch, "Higher Education and the Unity of Knowledge: An Operational Approach to the History of Thought," in Lyman Bryson, Louis Finkelstein, and R. M. MacIver (eds.), *Goals for American Education* (Ninth Symposium of the Conference on Science, Philosophy, and Religion in Their Relation to the Democratic Way of Life [New York: Harper, 1950]), pp. 102-105.

Some are mythic, that is to say, they explain unfamiliar and often frightening phenomena in terms of traditional myths such as that of Isis and Osiris in ancient Egypt, which was used, by analogy, to explain the changes of season.[17] Such mythic models were most frequently inherited and learned by what Deutsch calls mimesis or unanalyzed imitation.[18] A typology of models would also include the scientific, the historical, and the ideological. Scientific models, which in theory were open to empirical validation or invalidation, were used to discover, control, and predict the course of natural processes. Newton's mechanism-based model of the motion of large aggregates would be an example of a scientific model. Historical models are, to quote Belth, "concerned with the relation in thought between particular events of one time and particular events of another, and with the cumulative and directive effect that events have upon one another in the minds of men."[19] Like scientific models, historical models may be mathematical (usually, at least in more recent times, probabilistic); analogical (like Marx's iron laws of history which find their analogue in both the determinism of classical physics and the psychological determinism of organismic growth in the sense of Teilhard de Chardin); or even theoretical with analogical elements (such as the cyclic methahistory of a Toynbee or a Spengler). Finally, there are ideological models which "are bound to the systematic image of an unambiguous, perfect, orderly reality, which serves as the instrument for interpreting the imperfections which are all about us as we live out our lives."[20] An example of an ideological model would be that historic form of utopianism which is the scriptural communism of Marx and Lenin.

[17] Belth, *op. cit.*, pp. 180-81.
[18] Deutsch in Bryson *et al.* (eds.), *op. cit.*, p. 79.
[19] Belth, *op. cit.*, pp. 180-84. See also Henry Margenau, *Ethics and Science* (Princeton, N.J.: Van Nostrand, 1964), pp. 65-66, 89-90.
[20] Belth, *op. cit.*, pp. 180-84.

The analogical suggestiveness of models for disciplines external to those particular disciplines in which such models have their genesis is demonstrated by the models of society currently employed in sociology, almost all of which have been imported from the biological sciences, the physical sciences, or mathematics. These include such models as the evolutionary, the organismic, the equilibrium, the classical physical science, and the statistical-mathematical.[21] The cascading quality of analogical suggestiveness may be seen in the transposition of the notion of entropy from its original locus in thermodynamics to a central position in information theory and, via information theory, into numerous other disciplines. Using Claude Shannon's articles on information theory in the July and October 1948 issues of the *Bell System Technical Journal* as a conceptual unit capable of diffusion, Randall Dahling traced, through the examination of publications, the way in which this conceptual innovation penetrated the various disciplines. In addition to its evocative qualities, Dahling determined that the notion of information theory spread because: (1) communication is a common ground for many disciplines; and (2) because its mathematical formulation and methodology was appealing to natural scientists and the increasingly sizeable group of social scientists which is oriented to quantification.[22] In the final analysis the adoption of a conceptual innovation by scholars in disciplines

[21] See Alex Inkeles, *What Is Sociology? An Introduction to the Discipline and Profession* (Englewood Cliffs, N.J.: Prentice-Hall, 1964), pp. 28-46.
[22] Randall L. Dahling, "Shannon's Information Theory: The Spread of an Idea," in *Studies of Innovation and of Communication to the Public* (Studies in the Utilization of Behavioral Science, XI [Stanford: Institute for Communication Research, Stanford Univ., 1962]), pp. 119, 136. Chronologically, the diffusion of the information theory concept followed this order: communications engineering, psychology, physiology, physics, linguistics, biology, sociology, optics, statistics, and journalism. It is to be anticipated that more can be learned about the spread of ideas from the citation network studies of Derek Price at Yale, Eugene Garfield at the Institute for Scientific Information, Ben-Ami Lipetz in Carlisle, Mass., and Norman Kaplan at George Washington University.

external to its source seems to rest with some notion of congruence or "fit" between the "culture" (or set of intellectual commitments) of a potentially receptive discipline at a given point in time, and the nature of the new idea itself. Incongruence between a potentially pervasive concept and the existing *Weltanschauung* shared by the set of potentially receptive scholars in an external discipline can result in a lag in the adoption of the concept whose implications, for a variety of possible reasons, cannot be immediately sensed.[23] It is entirely possible, moreover, that the cross-disciplinary utility of concepts increases as such concepts undergo an evolutionary process of refinement and reinterpretation in their disciplines of origin. Etymologically, for example, the concept of force had a strongly animistic cast. Its progressive refinement at the hands of Aristotle, Galileo, Kepler, Newton, Kant, Mach, and Hertz has resulted in the present period in a concept of force which is almost purely mathematical in meaning, that is to say, without immediate physical referents.[24]

The capacity to be able to predict the diffusion of an idea into adjacent domains, even on a probabilistic basis, could have important implications for the ongoing organization of information in libraries, and for the restructuring of the bibliographic devices which provide access to that information. Even without such predictions, as Don Swanson has suggested, adequate circulation information and the careful observation of in-library user behavior would permit the association of users with those portions of the graphic record which they use, in such a way that the development of new fields like bionics (or artificial intelligence) might be anticipated on the basis of the significantly large common group of library users which is making intensive use of the literature of neurology and information theory.[25] To be sure, citation analysis might well provide information on patterns of concept diffusion, however, the time differential between the actual acceptance of an externally generated concept by a receptor field and the first publication in that field employing the concept is substantial enough to render such an approach overly a posteriori to be of real utility in the restructuring of bibliographic arrangements.

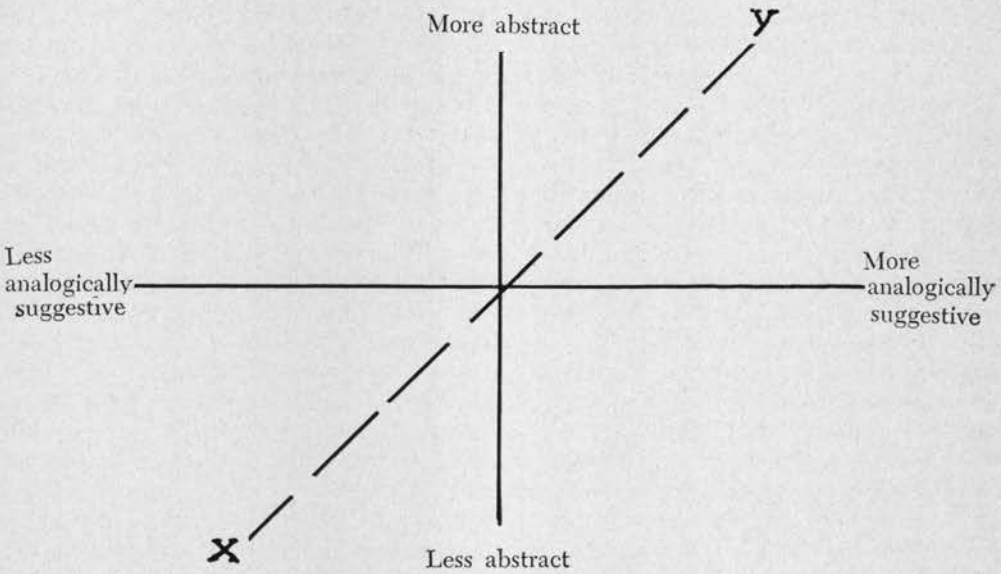
Another way of conceptualizing the growth of knowledge is within a framework of progressive subordination, via hierarchical ordering, of old concepts, theories, and hypotheses to new ones. Such subordination imparts to the structure of knowledge a "nesting" effect in which newer, more abstract concepts serve as receptacles for the older, less abstract concepts which are their special cases. Another image would be that of intersecting continua. If a vertical continuum ranging from "less abstract" to "more abstract" is developed to intersect with a horizontal continuum moving from "less analogically suggestive" to "more analogically suggestive," the relationship defined by the line *xy* in the following diagram could be expected to develop.

The line *xy*, it can be seen, expresses the direct relationship between abstractness and analogical suggestiveness. Lest the foregoing seem overly tautological, it can be speculated that the abstract concepts of "uncertainty" and "complementarity" (or the duality of wave and particle motion) in quantum physics,

[23] See Elihu Katz, Margin L. Levin, and Herbert Hamilton, "Traditions of Research in the Diffusion of Innovation," *American Sociological Review*, XXVIII (April 1963), 240, 249-50.

[24] The evolution of the concepts of space, force, and mass have been considered in several books by Max Jammer. See William R. Catton, Jr., "The Development of Sociological Thought," in Robert E. L. Faris (ed.), *Handbook of Modern Sociology* (Chicago: Rand McNally, 1964), p. 935.

[25] Don R. Swanson, "Dialogues with a Library Machine" (Chicago: Graduate Library School, Univ. of Chicago, n.d. [Mimeographed]), p. 9.



not to mention the emerging principles linking matter and anti-matter, will suggest more about the nature of social phenomena and, by extension, about the limits of explanation in the social sciences than any of the concepts heretofore imported into this broad area of inquiry. Moreover, any general theory which claims to explain behavior in a plurality of phenomenal systems must be sufficiently abstract and deductively fecund to account not only for already observed ismorphism in a diversity of behavioral realms but also for behavior in systems which have not yet been empirically identified. Returning to the hierarchical ordering of concepts according to comprehensiveness, Boulding has observed that—

> The old is almost invariably seen as a special case of the new. Algebra generalizes the operations of arithmetic. The calculus generalizes some operations of algebra. The theory of games is a generalization of the theory of simple maximization. In physics, Newtonian mechanics is seen as a special case of the mechanics of relativity. In economics, the Keynsian system is easily seen as the generalization of the classical system.[26]

The excellent studies of Thomas Kuhn on the revolutionary character on paradigm change in science[27] notwithstanding, it would seem that there is a continuity in the development of knowledge which is remarkably antithetical to revolution. Michael Polanyi suggested this continuity when he characterized the Copernican system as no less anthropocentric than the system of Ptolemy in that the former satisfied man's need to abstract as well as the latter exploited the enjoyment men find in the use of their senses.[28] Indeed, Leonard Nash

[26] Boulding, *op. cit.*, pp. 77-78. See also Leonard Nash's distinction between "falsification" and "subordination" (or incorporation) in *The Nature of the Natural Sciences* (Boston: Little, Brown, 1963), pp. 286-96.

[27] See Thomas Kuhn, *The Structure of Scientific Revolutions* (Chicago: Univ. of Chicago Pr., 1962).

[28] Michael Polanyi, *Personal Knowledge: Toward a Post-Critical Philosophy* (London: Routledge and Kegan Paul, 1958), pp. 3-4. It might not be unthinkable to suggest that the Ptolemaic system was a rape of precisely those capacities which distinguish man from lower orders of living systems, namely, his ability to abstract and theorize. Nash has observed that despite the overthrow of the Ptolemaic system by the Copernican, astronomers continued to speak of the regularity of motion, orbits, and objects in the sky. See Nash, *op. cit.*, pp. 284-92.

has used the term evolution to describe the growth of science. Invoking the analogy of organisms evolving toward higher levels of organized complexity, he supports the image, originally proposed by Samuel Sambursky, of science as advancing by "concentric approximations," that is to say, through viewing new, more abstract theory as possessing many of the components of the theory or theories that it has subordinated.[29] It may not even be stretching the point to suggest that the development of new paradigms in science approximate the emergence of new species in biology. The principle of ontogeny recapitulating phylogeny suggests that the life history of an individual organism from conception on takes it through roughly the same stages that evolution took that species of organism up to the time the individual organism came into existence. In much the same way, a new, comprehensive theory in science typically incorporates the lower order theoretical structure which had developed in science up to that time, but represents an improvement on the latter in its organizational and correlative powers.[30]

There are other ways in which the fundamental continuity of knowledge may be observed, in the humanities as well as the natural and social sciences. A familiar form of identifying continuities in literature and other humanistic disciplines is through the analytical isolation of those formative structures that Jung called archetypes, or primordial ideas which are rooted in the collective unconscious of the human race.[31] Jung conceived archetypes less in terms of inherited ideas about love or religion or, more negatively, about the perversion of love in lust or hatred, but rather as the inherited potential for such ideas, a potential which began to cumulate at that point in historical time when man became conscious of himself as somehow different or set apart from the rest of nature.[32] Briefly defined, archetypes are symbols which "carry the same or very similar meanings for a large portion, if not all, of mankind."[33] In the archetypal mode of literary evaluation, the focus is on the genesis and persistence in literature of symbolism such as day and night, spring and autumn, birth and death, innocence and experience, and on such provocative figures as Faust, Odysseus, Satan, and Prometheus. There are dangers, of course, in the inappropriate use of archetypes in the explanation of literature. One is reminded of Douglas Bush's witty comment on archetypes: "Some ideas, such as frustration, became master keys for opening all doors. A crowd of authors and characters were seen trudging along the road back to the womb. Along a parallel road stumbled another crowd driven by the death wish."[34]

Some archetypes, it may be supposed, can be explained by certain constraints of the natural order. Physically, all men are subject, at least in their natural state, to the laws of gravitation. As a consequence, the obstacles to vertical move-

[29] Nash, *op. cit.*, pp. 286-88.

[30] In a somewhat different but analogous context, Talcott Parsons has defined an "evolutionary universal" as "a complex of structures and associated processes the development of which so increases the long run adaptive capacity of living systems in a given class that only systems that develop the complex can attain certain higher levels of general adaptive capacity." See his "Evolutionary Universals in Society," *American Sociological Review*, XXIX (June 1964), 340-41.

[31] These archetypes may be distinguished from Plato's ideas or the categories of Kant in that they are not completely a priori, having had their genesis in man's own primordial experiences. See Carl Gustav Jung, *Collected Works* (Vol. IX, *The Archetypes and the Collective Unconscious* [New York: Pantheon, 1959]), pp. 3-4, 16, 23. Jung has referred to archetypes as the "residua of racial experience." See Maud Bodkin, *Studies of Type-Images in Poetry, Religion, and Philosophy* (London: Oxford University Press, 1951), p. 9. See also Jolande Jacobi (ed.), *Psychological Reflections: An Anthology of the Writings of C. G. Jung* (New York: Harper, 1953), pp. 38-39.

[32] See Jacobi (ed.), *op. cit.*, p. 36. Jung likens archetypes to receptacles which are filled in by the cultural experience of a lifetime.

[33] Philip E. Wheelwright, *Metaphor and Reality* (Bloomington: Indiana Univ. Pr., 1962), pp. 111-12.

[34] As quoted in William C. DeVane, *Higher Education in the Twentieth Century* (Cambridge, Mass.: Harvard Univ. Pr., 1965), p. 111.

ment of an upward sort are more formidable than those confronting one who seeks to go down. Therefore, the basic notions of dominance, achievement, loftiness, and excellence, all of which represent states one must struggle for, are associated with upward movement rather than with the ease of downward motion.[35] Most archetypes, however, are elusive and their essence can be only indirectly explained through the use of imperfect metaphors. Nor does continuity in archetypal meaning always prevail, everywhere and in every period. Symbolically, the wheel as archetype, may have either positive or negative significance. In the East it has the positive connotation of the persistent cycle of birth, death, and rebirth. In the West, it has a more ominous symbolic meaning related to the role of fortune (for example, the wheel in the game of roulette) in determining one's success or failure.[36] Fustel de Coulanges devoted most of his life to studying the elements, particularly religious beliefs informed by archetypes, influencing the growth of Greek and Roman institutions, particularly the life of the city.[37] Mircea Eliade has sought to identify the formative concepts at work in a number of archaic societies, and found in the course of his investigations that time and the flow of history in such societies is regulated mainly by the operation of archetypes. These archetypes expressed the ontology of primitive societies like those of ancient Mesopotamia or aboriginal Australia—societies which largely lacked the philosophical language to express their notions of being and reality. The ontology of such societies had to be inferred from their rites, symbols, and myths.[38] It was observed that the life of primitive man was fulfilled only to the extent that he performed certain paradigmatic gestures or spoke symbolically powerful words which originated with the celestial gods. The mountains that he climbed, the land that he cultivated, the rivers that he navigated, all of the acts of primitive man, found their meaning in the archetypal actions primordially performed by transcendent gods. The temples and cities of ancient men were also patterned after such extraterrestial prototypes. Babylon, for example, was surrounded by a vast circular territory bounded by a river (the Euphrates) in precise imitation of the Babylonian vision of a celestial heaven.[39] In the sense that these godly actions took place at the beginning of time, the ancient man participated in the beginning of things through their re-enactment.

Two of the most fundamental archetypes which recur in philosophy and religion as well as literature are those of saving wisdom and spiritual rebirth.[40] Northrop Frye has proposed that these and other very powerful archetypes are embodied in the Greek classics, especially Homer, and in the Bible and have reverberated through literature to the present period. He sees the myths of creation and fall in Genesis and of the pastoral life as the strongest formative principles in religion and social, political, and philosophical thought.[41] Put another way, literature from the end of the first century A.D. to the present is mainly derived and mimetic, deriving its thematic content from the past and its substantive content from its own historical period in much the same way that a Jungian archetype maintains its form while wear-

[35] Wheelwright, *op. cit.*, pp. 111-12.

[36] *Ibid.*, p. 126.

[37] See Numa Denis Fustel de Coulanges, *The Ancient City: A Study on the Religion, Laws, and Institutions of Greece and Rome* (Garden City, N.Y.: Doubleday, 1956), pp. 11-14, 142-73.

[38] Mircea Eliade, *The Myth of the Eternal Return* (New York: Pantheon, 1954), p. 3.

[39] See *ibid.*, pp. 9-10.

[40] Bodkin, *op. cit.*, pp. 35, 175.

[41] See Northrop Frye, "The Developing Imagination," in *Learning in Language and Literature* (Cambridge, Mass.: Graduate School of Education, Harvard Univ., 1963), pp. 31-60. Also his "Introduction" in Northrop Frye (ed.), *Design for Learning* (Toronto: Univ. of Toronto Pr., 1962), pp. 3-17.

ing the experiential clothing of different eras. In this perspective, literature is the embellishment and elaboration of timeless themes. The literateur, in the final analysis, has no really new stories to tell. This thematic continuity is described by Frye in the following way: "At a point in the narrative, recognition point, or as Aristotle calls it *anagnorisis,* the reader knows what is going to happen, but he wishes to continue participating in the completion of the design."[42]

As units of discourse in literary criticism, archetypes are conceptually important since they impart to literature its characteristic forms.[43] Even in music, one can sense that "inner unity of symbolic forms" that Ernst Cassirer saw as providing a basic homogeneity to human culture.[44] Leonard Meyer, bridging between music and psychology, has hypothesized that meaning in music may be interpreted in terms of the amount of congruence which prevails between one's generalized expectations about what will come next in a score and what actually does. Skill in composition then rests with the composer's ability to manipulate this tension of expectation which is general for most of mankind. Music which satisfies man's every expectation is, in this theory, highly redundant and boring to the musical gourmet. It is from the uncertainty of music and its probabilistic character that man draws his pleasure.[45] Great composers, like Beethoven and Mozart, achieve simultaneously a maximum of uncertainty or surprise and a maximum of fulfilled expectations.[46] To the continuities and discontinuities of the music, man brings his generalized aesthetic tension. From the foregoing it can be seen that both literature and music, though by and large in the stage of taxonomy or naive induction, are capable of sustaining conceptual frameworks which articulate the parts of the whole. Within this perspective, chronological classification or grouping by form seem primitive indeed as organizing principles in literature and music. Frye has contended, as a matter of fact, that ultimately literature, like mathematics, has a self-contained form and a system of postulates which require no empirical referents. He has even wondered, though partially discarding the notion, whether the same formative structures which recur in the history of literature are operative in other fields which are dependent on verbal structures, like metaphysics, theology, history, and law.[47] At all events, in literature and music, indeed in the humanities generally, there are scholars devoted to Matthew Arnold's precept of "letting the mind play freely around a subject in which there has been much endeavor and little attempt at perspective."[48] From the point of view of the writer, the foregoing demonstrates that there are elements of structural continuity in several fields of the humanities and that where structure persists over time, even in the midst of seeming uniqueness, the prospect for systemic outlook is radically improved.

Corresponding to the archetypal patterns which structure the products of artistic activity are what Gerald Holton has called the "themata" of science. It is increasingly sensed in scientific quarters that there are elements at work in

[42] Frye makes many incisive comments on this problem in his "The Road to Excess" in *Myth and Symbol: Critical Approaches and Applications* (Lincoln: Univ. of Nebraska Pr., 1963), pp. 3-38.

[43] Northrop Frye, *Anatomy of Criticism: Four Essays* (Princeton, N.J.: Princeton Univ. Pr., 1957), pp. 341-42.

[44] See Cassirer, *An Essay on Man: An Introduction to a Philosophy of Human Culture* (New Haven, Conn.: Yale Univ. Pr., 1944), pp. 67-68, 70-71, 222.

[45] There are some parallels here with the measures of information transmission in information theory.

[46] Leonard B. Meyer, *Emotion and Meaning in Music* (Chicago: Univ. of Chicago Pr., 1956), pp. 1-42.

[47] Frye, *Anatomy of Criticism,* pp. 350-54.

[48] Quoted in *ibid.,* p. 3.

the process of theory construction, as well as discovery and justification, which are not verbalized or made explicit but which, nevertheless, seem to possess an historic continuity.[49] At least one prominent scientist sees the primordial formulations of science, which persist even to the present day, as deriving mainly from the unanalyzed depths of human consciousness and as receiving their initial embodiment in religion and philosophy.[50] As a result, so the argument goes, a large part of the history of science can be interpreted as a continuing dialectic between those who would emphasize stability and being (as atomism) and those who would emphasize becoming (reality as a continuum), positions which had already received reasonably refined formulation in Greek philosophy.[51] René Dubos has noted that

> . . . the theory of dynamic equilibrium, which was the last word in biochemical sophistication when first enunciated three decades ago, is now being questioned again by a new generation of biochemists. In a very recent series of lectures an eminent biochemist suggested that life might reside in the stability and continuity of nonliving macromolecules within the cells, rather than in the transformation of components which undergo rapid turnover. According to this biochemist, in other words, the course of life might be found in the Cartesian concept of "being" rather than in the concept of "becoming" which had its origin in Heraclitus of Ephesus. . . .[52]

Less Jungian in tone and in general less speculative with regard to the possible sources of persisting images in science is Holton's discussion of themata.[53] He begins by citing the recent discovery by Alexandre Koyre that Newton suppressed and failed to publish in Book III of his *Principia*, a fifth rule of reasoning in philosophy which read, in part, as follows: "Whatever is not derived from things themselves, whether by the external senses or by internal cogitation, is to be taken for hypotheses. . . . And what neither can be demonstrated from the phenomena nor follows from them by argument based on induction, I hold as hypotheses."[54] As operative in science, themata are propositions which are "entirely unverifiable and unfalsifiable, yet not quite arbitrary. . . ." What may be called the contingent plane of science—that is to say: (1) statements which are empirically based; and (2) statements deriving from logical or mathematical processes—is thus seen as overly limiting.[55] Holton believes that any complete understanding of theory construction in science must take into account a thematic dimension as supplement to the two-dimensional contingent plane. He suggests, for example, that the thematic component of the concept of force is the masculine principle of potency. This principle of potency has been differently incarnated at various points in human history by scholars as diverse as Aris-

[49] Koch in Wann (ed.), *op. cit.*, pp. 21-22. See also Polanyi, *op. cit.*, pp. 15-17.

[50] René Dubos, *The Dreams of Reason: Science and Utopias* (New York: Columbia Univ. Pr., 1961), p. 123.

[51] In his *The Edge of Objectivity* (Princeton, N.J.: Princeton Univ. Pr., 1960), Charles Gillespie contends that atomism (or atomicism) has been the most productive organizing structure in the history of science. See Dubos, *op. cit.*, pp. 120, 126, 128.

[52] Dubos, *op. cit.*, p. 124. Harvey Brooks has observed that the stability of dynamic equilibrium, seen macroscopically, may turn out, microscopically, to be a flux of opposing motions which simply cancel each other out. See his "Scientific Concepts and Cultural Change," *Daedalus*, XCIV (Winter 1965), 73.

[53] Holton would not go so far, for example, as Kant who saw the "categories" as prior to human experience and functioning as stereotyped intellectual equipment common to all men. See Deutsch in Bryson *et al.* (eds.) *op. cit.*, p. 58.

[54] Gerald Holton, "Presuppositions in the Construction of Theories," in Harry Woolf (ed.), *Science as a Cultural Force* (Baltimore: Johns Hopkins Pr., 1964), p. 83.

[55] Force, for example, can be "observed" empirically in the deflection of solid bodies as detected by a measuring instrument. The logical or mathematical dimensions of force as it operates in the contingent plane of science are to be found in the mathematical laws of vector calculus.

totle, Galileo, and Newton, among others. The persistence of the potency themata can be seen in the early failure of seventeenth-century natural philosophers to distinguish between the Aristotelean notion of force as that which produces motion or velocity and the Galilean concept of force as that which produces a change in velocity or acceleration, that is to say, a ball to which one imparts motion will continue to roll along a reasonably friction-free horizontal plane even after one has ceased to impart motion to it.[56] Other themata are those of (1) conservation of energy; (2) atomism; (3) the probabilistic character of behavior; and (4) the behavior of things as a consequence of their shape (for example, the earth rotates because of its near sphericity). A striking example of themata in action is provided by the contemporary controversy between the evolutionary and steady state theories of cosmology and the more ancient Milesian and Parmenidesian cosmologies. The fission of primeval matter and its later fusion in Milesian cosmology has its echo in the expansion-contraction cycles of the more modern pulsating universe of the evolutionary theory. And the steady state hypothesis may, of course, be equated with the ideas of Parmenides. In general, themata are ascendant or obscure in various intellectual epochs because of the seeming relevance of their power to structure reality. With the rise and fall of scientific fashions, they are utilized or put into storage but are never really disposed of or discarded with finality.[57]

It may perhaps be argued that the foregoing extended discussion of structural continua in the history of the sciences and the humanities is overly superficial and that any investigator seeking to identify historical discontinuities would be, at least, equally rewarded. That may be so, and yet one cannot fail to be somewhat impressed by certain functional parallelisms between themata and archetypes. Indeed, a reasonable extension of general systems theory, however quasi-scientific, might be to seek ismorphism between archetypes and themata as they are employed respectively, to organize the reality of the humanist and the scientist. At all events, the continuities represented by such formative elements might well provide a useful historical adjunct to the emerging recognition of general theories of systems. At this point in the course of the paper, it may be appropriate to consider the attempts which have been made to view knowledge as a structural unity, particularly as such integrative structures have been supportive of general education in colleges and universities.

Historically, efforts to view knowledge holistically begin with the philosophers of classical Greece and run all the way to the general systems theorists of the twentieth century. In the *Sophist*, Plato directly concerned himself with knowledge in its unity and diversity. And the seventeenth and eighteenth centuries were especially characterized by efforts to see knowledge whole. Descartes' paradigm for the unification of knowledge, as explained in his *Discourse on Method*, was a primitive reduction of all knowledge to the relationships at that time, seen as inherent in geometry. Francis Bacon, in his *Novum Organum*, sought to unify knowledge through limiting it to the output of those areas of inquiry which were amenable to the application of natural philosophy. Leibnitz and the French Encyclopedists deplored as artificial the arbitrary division of knowledge into subject matters, but differed in their plans for the encyclopedic organization of knowledge. The former, in his projected encyclopedia, would have made the logical (or synthetic-theoretic) ordering of knowledge primary and would have employed an index to provide classification by subject. Diderot

[56] See Northrop, *op. cit.*, pp. 22-34.

[57] Holton in Woolf (ed.), *Science as a Cultural Force*, p. 101.

and d'Alembert, the French Encyclopedists, made classification by subject primary and utilized a cross-reference arrangement to demonstrate horizontal connections. Kant, in radical disagreement with his predecessors, saw each subject matter as a self-contained logical system whose place in the total scheme of things was defined a priori by knowledge as an organic whole. For Descartes and Leibnitz, knowledge was simply the sum of its constituents. For Kant, all knowledge was a system and the discrete subject matters were logically self-contained subsystems whose articulation within the organic whole was defined by the system itself.[58] In Kant's judgment, therefore, the division of knowledge was anything but arbitrary. Throughout the course of history the unification of knowledge has been seen as a desirable goal, at times simply for its own sake, at other times for the sake of its redeeming social importance—that is to say, the periodic demand for knowledge codification as essential to the coordination of human and physical phenomena in the practical sphere. The efforts to unify knowledge have been formally embodied in the formation of special groups (like the Society for General Systems Research, and the Foundation for Integrative Education); in the construction of encyclopedias (like the International Encyclopedia of Unified Science); and in the educational efforts of Comenius and the Pansophists or the formulators of the encyclopedic curricula in the eighteenth century universities of what is now Germany.[59]

During the two decades preceding 1950, physics (or better, physical statements which had been purged of all metaphysical content) was seen as the prime discipline to which all other scientific disciplines could be reduced.[60] The same kind of disciplinary ethnocentrism which had earlier made theology and geometry the measure of all knowledge now made physics the keystone of the twentieth-century edifice of knowledge.[61] Of late, however, the notion of emergence, which is the inverse of reduction, has been popular. Like reduction, emergence implies the idea of hierarchical order, but the focus is on the ascendant rather than the descendant nature of vertical order. Caws has provided this description of the process of emergence:

> We say that one science is emergent with respect to another if there is some event described and explained by the former, whose parts are described and explained by the latter, such that no combination of the explanations of the parts as described by the latter can be made to yield an acceptable explanation of the whole as described by the former. Psychology would, according to this criterion, be emergent with respect to physiology if no set of explanations of brain structures could be made to yield an acceptable explanation of, for example,

[58] Caws has suggested that, vis-à-vis the discrete sciences, there is a methodological unity based on the sharing of a single logic. See *op. cit.*, p. 336.

[59] See Robert McRae's excellent discussion of efforts to unify science during the seventeenth and eighteenth centuries in his *The Problem of the Unity of the Sciences: Bacon to Kant* (Toronto: Univ. of Toronto Pr., 1961), especially v-x, 3-23. See also William O'Meara, "Observation, Interpretation, and Integration," in F. Champion Ward (ed.), *The Idea and Practice of General Education* (Chicago: Univ. of Chicago Pr., 1950), pp. 235-37, where the strategies employed in attempts to integrate knowledge are classified as encyclopedic, theoretical, and practical.

[60] Described by Rudolf Carnap as quantitative description of space-time-place. See Joergen Joergensen, *The Development of Logical Empiricism* (International Encyclopedia of Unified Science, Vol. II, No. 9 [Chicago: University of Chicago Press, 1951]), pp. 81-82. The logical empiricists, in general, tried to avoid the ambiguity and metaphysical pregnance of natural observational language. P. W. Bridgman, for example, developed the notion of operations in which he did not deny the possible existence of that which could not be subjected to the operations of measurement, but did deny the scientific validity of concepts which did not possess a corresponding set of operations—operations which, contrary to widespread understanding, could be either physical or mental. An example of the latter would be mathematics in which one desires to determine whether a series of magnitudes is continuous. See Caws, *op. cit.*, pp. 319, 321-22 and Joergenson *op. cit.*, p. 56.

[61] Such reduction can be viewed in the image of a chain—from sociology to psychology to biology to chemistry to physics. See O'Meara in Ward (ed.), *op. cit.*, p. 233. Caws has suggested that the sciences which formed the links in this chain of reduction had, at least in part, to have reached the nomological (or generalized empirical theory) stage of inquiry. See Caws, *op. cit.*, p. 283.

some exhibition of problem solving behavior . . . the defender of emergence would claim that there is something about the whole event as described in the emergent science to which the concepts of the science from which it is emergent are not even relevant. The whole, he would say, is greater than the sum of its parts. . . .[62]

The historic search for integrating principles in American higher education is interesting to review, especially in light of the efforts at knowledge unification just discussed. During a substantial part of the nineteenth century, and even before that in what William Cowley calls the classical American literary college, a course in moral philosophy, typically taught to seniors by the president of the college, was regarded as the integrative capstone of the curriculum. Such courses were ordinarily a curious melange of religious orthodoxy and personal opinion. At Williams College, for example, President Mark Hopkins, who could without exaggeration be called the worst sort of dilettante, described his course in moral philosophy as covering "man in his unity and God in his sovereignty."[63] In Catholic institutions of higher learning, theology, by virtue of the nobility of its object (God) and the reliability of its sources (Divine Revelation as interpreted within the teaching authority of the Church), was viewed as the queenly discipline to which all others were ultimately linked.[64] In the 1930's and 1940's Robert Maynard Hutchins championed the primacy of metaphysics, not simply as the study of first principles, but of all that such principles imply for behavior in human and nonhuman reality.[65] Yet in the late 1940's and early 1950's, the innovating college at the University of Chicago was by no means oriented to the Great Books or even the metaphysics of classical antiquity. To be sure, philosophy and history did serve as the disciplines of integration in the curriculum, but the selections from original works, syllabi of "Great Snippets" as they were called, the content of which was ordered by philosophical and historical principles, were quite modern in origin and the medieval period was, on the whole, rather underrepresented. The objective of this curriculum was to develop in students the capacity to think critically and judge wisely.[66] There are many indeed who view the "Old College" at Chicago, with its symbol of erudition and intellectual high play—Aristotle Schwartz —as a remarkably successful experiment in higher education. Those who implemented the college curriculum were concerned that the students grasped ideas and methods and that they learned a little bit about the different ways in which knowledge might be structured. They were not interested in stuffing students with subject matter and low-order empirical content.[67] It is curious that in the latest reorganization of the college, adopted within the last few months, there is the suggestion that the older emphasis on acquainting students with the structure of knowledge, despite the intervening increase in low-order empirical knowledge, is no longer viable.

[62] Caws, *op. cit.*, pp. 308 and 309.

[63] Quoted in Rudolph, *op. cit.*, pp. 140-41. There is considerable evidence that Hopkins, though apparently popular with students and alumni, was an anti-intellectual who eschewed Kant and had not even read Darwin or Huxley. He was not, in a phrase, the kind of professor that a really able student would like to have seated opposite him on a log. See Bruce Dearing, "The Myths about the College Teacher," *Saturday Review*, XLVII (January 1964), 65.

[64] See Vincent E. Smith, *The School Examined: An Essay on the Curriculum* (Milwaukee: Bruce, 1960), pp. 70-94. Christoper Dawson, the noted historian, has more recently suggested the study of Christian civilization as an integrating principle in higher education.

[65] Robert Maynard Hutchins, *The Higher Learning in America* (New Haven, Conn.: Yale Univ. Pr., 1936), pp. 107-108.

[66] F. Champion Ward, "Principles and Particulars in Liberal Education," in Cohen (ed.), *op. cit.*, pp. 122-23, 127-28.

[67] Richard McKeon has given an account of the shift away from an emphasis on discipline and method, which prevailed in the medieval period, to a concern, in the Renaissance, with the facts and data of individual subject matters. One of the fundamental objectives of the pre-1953 college curriculum at the University of Chicago was to sensitize the student to how bits and pieces of knowledge might be articulated in knowledge viewed as a seamless, but complex, whole. See McKeon in Cohen (ed.), *op. cit.*, p. 168.

Apparently the older ideal will survive only in the so-called "collegiate division" (or Division of Integrated Studies), one of the five divisions in which a student may now concentrate.[68]

Prior to 1942, the integration course in the college of Chicago was called "Methods, Values, and Concepts." After that year, it was known as Observation, Interpretation, and Integration and aimed at giving the student an "opportunity to acquire the knowledge and capacity necessary to work out for himself an intelligent theory on the interrelationships of the fields of knowledge."[69] A similar course, called "Organization, Methods, and Principles of Knowledge," still exists at Shimer College, a small experimental institution located at Mount Carroll, Illinois, which adopted the Chicago College Plan of general education in the early 1950's and has promoted its evolution.[70] In the main, however, the various concepts of general education which were formulated earlier in the century are encountering rough sledding. Substantive innovations like the sequence of courses in contemporary civilization adopted by Columbia College in 1919, the broad humanities courses developed at Reed College in 1921, and the earlier attempt at Chicago to formulate a course on the Nature of the World and Man (1924)[71] have, it appears, few imaginative parallels in the present period. It is true, of course, that in portions of the country—for example, New England with its Goddard and Marlboro—there are colleges which continue to emphasize those principles upon which institutions like Bennington and Sarah Lawrence were founded earlier in the century, namely, Freudian psychology and the educational philosophy of Dewey. It is also true that there are new colleges being based on technological innovations, or on what this writer would call secondary innovations when contrasted with a primary innovation like the restructuring of knowledge—even though, for example, the construction of programed educational materials does result in the rethinking of how subject material can be most adequately presented. There is also the call for colleges with a concern for their impact on the values of students and with the posing of relevant sets of value alternatives for student choice.[72] There are even colleges, like Shimer and Monteith College of Wayne State University, which are devoted to constant review of the way in which knowledge is organized for transmission to students. By and large, however, there is relatively little effort in the universe of higher education at organizing knowledge within frameworks which are fundamentally new, and it almost seems as if those engaged in higher learning are waiting for a final theory of learning based on neurophysiology or an epistemologically perfect conceptualization of "reality." Perhaps this assessment of things as they now stand is overdrawn and unfair, however, since there are many factors constraining the development and implementation of schemes of general education.[73]

[68] The others are Physical Science, Biological Science, Social Science, and the Humanities. See Wayne C. Booth, "The New College," *The University of Chicago Magazine*, LVIII (November 1965), 8-10. It is freely admitted that a major rationale of the reorganization was to link the college more closely to the interests and commitments of the graduate divisions and to check the flow of faculty away from a commitment to undergraduate teaching and towards an interest in the discipline-oriented research and graduate teaching of the subject departments.

[69] O'Meara in Ward (ed.), *op. cit.*, p. 234.

[70] See the *Shimer College Catalogue, 1964-1965* (Mount Carroll, Illinois: Shimer College, December 1963), pp. 3, 39.

[71] See Rudolph, *op. cit.*, pp. 69, 76.

[72] Such a concern has been reflected recently in the presidential remarks of both Nathan Pusey of Harvard and John Sloan Dickey of Dartmouth.

[73] Chicago of course has substantially modified its pre-1953 program of prescribed studies in general education and now permits students to elect major concentrations. Columbia College has also, in recent years, cut back on its two-year sequence of integrated social science studies called "Contemporary Civilization." Both actions, while obviously motivated by a multiplicity of factors, suggest that the prescription of general content for all may be less viable as a strategy than to modify the presentation of general content so as to fit the cognitive structure of the individual learner.

Not the least of the constraints effecting general education at any level of higher education are the subject organization and narrow emphases of graduate study. Scholars who develop a general orientation do so, one suspects, almost in spite of what they have been exposed to, with minor exceptions, during their upper division undergraduate and graduate preparation. In addition, there is the widespread assumption that general education is being squeezed out by the percolation of specialized interests from the graduate schools standing above and the appropriation of its very content by the high schools positioned below. As the recent dialogue between David Truman and Jacques Barzun revealed, however, there is by no means general agreement on the nature of this squeeze—indeed, on whether or not any squeeze actually exists.[74] If Freud, Dostoevsky, and Marx were traditionally read in the good colleges during a student's lower division years, it is not now precisely clear what having "had" these authors in high school really means. It may, of course, mean that the high school student has genuinely grappled with the ideas contained in those words. It may also mean, on the contrary, that the acquaintance which he developed with these authors was superficial and that he has no sense of the importance of their writings in the larger context of knowledge. With respect to the articulated structure of education and the ways in which higher levels influence lower levels, Robert Wolff comments:

> Once more, the education of the present, for which the student gave up so much in high school, is sacrificed to the demands of the future. . . . Each present was sacrificed to the future, until the presents were all pasts, and the future an empty present. It is a familiar enough story in our society. We call it prudence, or deferral of gratification, depending on our tastes in moral discourse.[75]

Commitment to general education, or the view that knowledge should be looked at as a coherent and integrated whole, appears to provide limited payoffs—at least on the surface—for faculty members as well as students. After all, most institutions of higher education are discipline oriented, and rewards accrue to both students and faculty on the basis of their intradisciplinary performance. The marginality of general education, particularly with respect to the ongoing educational activities of the large universities, lies in its very definition as an approach which is nonspecialized, indeed those who espouse it often have a genuine aversion to academic specialization and its ultimate usefulness.[76] It cannot be denied, of course, that general education attracts the best and worst kinds of men, those who are capable of transcending specialization and those who, failing to make the grade in a particular discipline, try it as an alternative.[77] It is interesting to observe, nevertheless, that general education, in partial eclipse at the undergraduate level, is beginning to make inroads at the graduate level. At Chicago, for example, a number of those faculty members who were active in the "Old College" as professors or students now serve on one or

[74] David Riesman, reviewing a report on Princeton men made by Roy Heath in the mid-1950's, noted that those students who prepared senior honors theses severely limited the scope of their topics "in that mysterious way in which a college senior will say of himself, 'I'm a biophysicist with an interest in the morphology of the cell,' or 'I'm in eighteenth-century literature.' " See Roy Heath, *The Reasonable Adventurer: A Study of the Development of Thirty-six Undergraduates at Princeton* (Pittsburgh: Univ. of Pittsburgh Pr., 1964), xiii. Robert Wolff has even more recently observed that upper division undergraduates are, in many of the strong autonomous and university-based liberal arts colleges, taking courses which are in reality baby graduate courses and writing senior honors theses which are in effect baby dissertations. See his "The Race to College," *Atlantic*, CCXVI (November 1965), 147.

[75] Wolff, *op. cit.*, pp. 147-48.

[76] Joseph R. Gusfield, "General Education as a Career: A Sociological Analysis," *Journal of General Education*, X (January 1957), 38.

[77] See Joseph Gusfield and David Riesman, "Faculty Culture and Academic Careers: Some Sources of Innovation in Higher Education," *Sociology of Education*, XXXVII (Summer 1964), 305.

more of the three interdisciplinary committees which award doctorates, one might almost say, in general education—the Committee on Social Thought (originally founded in the early 1940's with Hutchins' active assistance, as the Committee on Interrelation), the Committee on the Analysis of Ideas and the Study of Methods, and the Committee on the History of Culture. The program of the Committee on the Analysis of Ideas and the Study of Methods resembles, in its objectives, the "Old College" course on Observation, Interpretation, and Integration; indeed, Richard McKeon, who taught that course, is the chairman of the committee. The graduate program in the History of Ideas at Brandeis University parallels the Chicago efforts in its attempt "to examine the interrelations of ideas in the various disciplines, the interconnections between theoretical and practical activities, and the reciprocal influence of ideas and historical events."[78] The existence of these programs at the graduate level and the anticipated development of similar activities in other universities would seem to augur well for undergraduate programs of general education which need a steady supply of generalists.

Two problems which are likely to bear upon efforts to reorganize knowledge are: (1) investigations into the nature of the relationship between the observer and what is observed in the natural and social sciences; and (2) investigations into the correlation of concepts, as mental constructs, with their neurophysiological bases. With regard to the former, it can be suggested that the mechanism which science has developed to cope with uncertainty in the subatomic realm—that is to say, the forecasting of averages in ensembles—will play an increasing role in the social sciences whose objects of inquiry—individuals, individuals in groups, and groups themselves—are also subject to behavioral deflection by the very act of observation.[79] It is as if the grossest observations of the social scientist affect those macro systems which he investigates in the same way that the finite quanta of energy which physicists employ when studying the microcosmos affect the behavior of elementary particles. The observations of both the social scientists and the physicist are, in deterministic perspective, what Henry Margenau calls "epistemologically destructive."[80] In his judgment, the statistical devices which explain subatomic behavior in probabilistic terms can also be applied to the kind of free behavior observed with respect to social groups.[81] The problem of predicting individual human action, even on a probabilistic basis, poses far more difficulty than the statistical explanations of social group behavior. While the suicide rate for a sizable population can be predicted within the limits of probability, a variety of factors carry adequate predictions of individual human action well beyond the capacity of existing statistical tools.[82] Nevertheless, science and social

[78] See the *Bulletin of the Graduate School of Arts and Sciences, Brandeis University, 1965/196* } (Waltham, Mass.: Brandeis Univ., 1965), pp. 108-18.

[79] Margenau, *op. cit.*, pp. 54-55. The analogue in the social sciences of Heisenberg's principle of uncertainty (or indeterminacy) in physics is the "Hawthorne Effect." In the late 1930's, investigators at the Hawthorne Plant of the Western Electric Company noted substantial variations in output during those periods when they were observing the production workers. Like the physicist dealing with elementary particles, the social scientist often encounters situations in which he can neither exactly know the present state of a system nor the precise nature of the correlation or causal relationship between the existing state of affairs and some future state of a system. The criteria for demonstrating determinism are to be found in Caws, *op. cit.*, pp. 300-301.

[80] Margenau, *op. cit.*, pp. 62-63. Karl Popper sees the solution (or better, resolution) of such fundamental epistemological problems in Alfred Tarski's theory of objective truth as synonymous with simple compliance with the facts. See his discussion of Tarski's thesis in *Conjectures and Refutations: The Growth of Scientific Knowledge* (London: Routledge and Kegan Paul, 1963), pp. 223-26.

[81] Margenau, *op. cit.*, pp. 93-97.

[82] Caws, *op. cit.*, p. 303. One reason why man's knowledge of the nature of nonhuman organic and inorganic entities may always exceed that which he has of himself is due to his anti-life or anti-nature posture. Such a posture has its origin in the very process of hominization and sets man epistemologically at a distance from nonhuman nature, thus providing,

science appear to share a statistical methodology which permits them to fathom, in like fashion, the complexity of social and subatomic life.

Another problem which has implications for the organization of knowledge is the relationship between conventional or nonexperimental epistemology and the newer empirical epistemology which is based on a variety of disciplines including neurophysiology and information theory. Needless to say, physiological theories of knowing have a much briefer history than their speculative counterparts.[83] The following remarks by some Oxford dons, attributable, it is my understanding, to Ralph Gerard, exemplify the difficulty of precisely correlating concepts with the structures and processes in the central nervous system on which they are based. The dons are reputed to have seen a group of women walking just ahead and obviously plying the trade.

Said one, "I see ahead of us a jam of tarts."
The second picked it up, "I should describe them as a volume of Trollop's."
The third rose to the occasion, "To me they are a flourish of strumpets."
The fourth was still abreast of the punning and said, "No, I think we have an anthology of prose."

The field of experimental epistemology received great impetus when Warren McCulloch first enunciated his postulate regarding the circular configuration of sets of neurons in the human nervous system. It is important to realize that for McCulloch the notion of neuron circuits was abstract and postulated and that within the bounds of his theory vacuum tubes or transistors might have served just as well as neurons. In this theory, circularly arranged neurons are set off through the firing of one neuron along the circuit which is in some way linked to a stimulus coming in over the sensory organs. After the initial firing, these neural rings continue to reverberate in much the same way that a circle of dominoes might continue to reverberate if the domino which originally set off the circuit by falling were stood up, along with the other fallen dominoes, before the reverberation had completed its circuit and reached again its starting point. In a neural circuit the recovery, or metabolic process in the individual neuron, must take less time than a complete reverberation of the circuit or the circuit will cease to reverberate. There are many such neural circuits present in the human nervous system, each capable, it is hypothesized, of trapping universals (like shape regardless of size) from environmental stimuli. It seems possible, moreover, that neural circuits of trapped impulses corresponding to environmental stimuli may be permuted and associated in the cortex and thus employed to define other, more fully abstract notions which will reverberate around their own neural circuits. Thus it is possible to postulate a cortical heirarchy containing neural circuits corresponding to philosophical concepts as well as inductive facts.[84] The source of concepts which are postulated by the imagination or intellect, that is to say—

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it is suspected, a kind of built-in objectivity vis-à-vis such phenomena. Such objectivity is probably denied the infant and young child who perceives a basic continuity between man and nonhuman life prior to that time when the limits of his ego and nonego become more sharply delimited. See Harold D. Lasswell, "The Major Trends in World Politics," in Harold D. Lasswell and Harlan Cleveland (eds.), *The Ethic of Power: The Interplay of Religion, Philosophy, and Politics* (New York: Harper, 1962), p. 349.

[83] Warren S. McCulloch, "A Historical Introduction to the Postulational Foundations of Experimental Epistemology," in F. S. C. Northrop and Helen H. Livingston (eds.), *Cross-Cultural Understanding: Epistemology in Anthropology* (New York: Harper, 1964), p. 183. Boulding has suggested that there may be a "Heisenberg principle" at work which will prevent investigators from knowing in any deterministic kind of way the nature of the physiological structures corresponding to man's knowledge structures. See Boulding, *op. cit.*, pp. 16-17. Whether this is so remains to be seen as Koch in Wann (ed.), *op. cit.*, pp. 4-5, has suggested.

[84] F. S. C. Northrop, *The Complexity of Legal-Ethical Experience: Studies in the Method of Normative Subjects* (Boston: Little, Brown, 1959), pp. 109-10.

not given in immediate sense experience, is a puzzle of far greater complexity. It is my understanding that experimental epistemologists know considerably less about the neurophysiological foundations of imagined or intellected concepts than about those of concepts which have, at some point in time, been abstracted from reality by a process of induction. With regard to the latter, it is believed that the regenerative activity in a neural circuit permits a trapped stimulus to reverberate initially for about half an hour. At the end of that time, if the reverberation has not been interrupted, the neurons along the circuit seem to contain an increased amount of ribonucleic acid and protein synthesis has gotten under way. This activity results in local changes in the electrical characteristics of the neurons themselves and leads, in some way, to the anatomical embodiment of the impulse trapped in the reverberating circuit.[85] Child psychologists see this ability to trap universals as developing in humans between the ages of three and eleven. From the third year on, for instance, children develop the capacity of "conservation," that is to say, they are able to conserve the notion of circularity despite changes in the area or color or background of the circles presented to them. Sometimes after developing the capacity to conserve, children begin to classify objects according to their configuration and to develop the power of seriation—that is to say, the ability to order objects hierarchically in terms of the increasing or decreasing value of some attribute. The principles of classification and hierarchical ordering (or grouping and seriation) are, in the judgment of Jean Piaget and his colleagues in genetic psychology at the University of Geneva, the basis for concept formation in adult life.[86]

The experimental epistemology which has developed up to now makes no claim to full physiological realism.[87] But the theoretical model developed by McCulloch does suggest that man does not bring a *tabula rasa* or Lockean blank tablet to the data provided him by his senses. And the notion of circular rather than linear ordering of neurons provides excellent support for this suggestion. In terms of concept formation and retention, there is a world of difference between closed loops and linear trains. The McCulloch theory also accords with Dean Wooldridge's hypothesis of attention-focusing mechanisms which not only select out those circuits which will be permitted to reverberate for the full half hour but also those which will be embodied in the brain over the long term.[88] At all events, it seems that man brings to his experience on an a priori structure rooted in the nervous system, through

[85] See McCulloch in Northrop and Livingston (eds.), *op. cit.*, pp. 191-92. Reverberation may also result in lowered resistance along a given circuit which can be easily reactivated by fresh perceptual stimulus (that is to say, recognition after long memory) or even by internal stimulus in the absence of perception (that is to say, in response to representation).

[86] Michael Wallach has described the child's ability to conserve as "the understanding that no change has occurred regarding one or more aspects of an object or a relationship, despite change in other perceivable features." See his "Research on Children's Thinking," in Harold W. Stevenson (ed.), *Child Psychology* (The Sixty-second Yearbook of the National Society for the Study of Education [Chicago: Univ. of Chicago Pr., 1963]), p. 246, also pp. 255, 259, 262, 264.

[87] Neurophysiological models of brain functioning can still be constructed, for, as McCulloch has put it, with the birth of cybernetics "teleology had its proper mechanistic base in engineering and biology." See McCulloch, in Northrop, *op. cit.*, pp 185-86.

[88] Dean Wooldridge has hypothesized a three-stage concept of memory: (1) The Sensory Input Stage (in which the datum of the senses is sorted for special attention and reinforcement by a focusing mechanism); (2) The Medium Term Memory Stage (corresponding to McCulloch's notion of reverberating circuits of neurons); and (3) The Permanent Memory Stage (in which a reverberating neural circuit is incorporated into the memory system, it is suggested, via some kind of change in the efficiency of the synapses which connect the neurons in the circuit involved in the final storage of a memory trace. W. Ritchie Russell has proposed that the low resistance neural circuits where a memory has already been established are constantly reinforced by the action of circuits which have been randomly generated through the occasional firing of neurons in the absence of some external stimulus. This means that the memory traces which have been stored in the storage mechanism of the brain grow progressively stronger over time through the action of these randomly generated circuits. See Dean Wooldridge, *The Machinery of the Brain* (New York: McGraw-Hill, 1964).

which incoming data is interpreted in much the same way that a program instructs a computer to perform certain operations on input data. This suggests further that the brain has a mechanical causality which is teleological in nature, that is to say, that the brain manipulates incoming information in terms of a hierarchical complex of goals and subgoals. Donald MacKay has speculated that the terms in which a given individual perceives some aspect of the empirical world will depend, in the final analysis, on the extent to which such a perception is supportive, nonsupportive, or capable of modifying the individual's hierarchy of goals. In the "internal matching" of stimulus and goal complex, the stimulus which generates no response in the goal apparatus will simply not be perceived or conceived in any meaningful way. These goal complexes, originally developed in response to what MacKay calls "patterns of demand" which the world presents to the organism, serve as organizing systems. Complex structures are thus perceived in terms of the internal organizers which previous goal seeking has developed in the individual. It is possible, MacKay suggests, for individuals to have "epistemological blind spots" in which no complex of organizers defined by the individual's goal complex corresponds to incoming sensory information. In other words, conceptual innovation at certain levels is out of the question for some individuals who—in order to react meaningfully to certain concepts—would need to demolish and reconstruct their goal complexes, a task of great formidability.[89] Herbert Simon and Allen Newell have sought to understand the operation of the organizers specified by goal complexes independently of the biology of the brain, by inferring from the behavioral response to a known input the kind of information processing that took place in the brain. In this way, a computer program can be developed which will permit a simulation of the problem-solving processes in a sophomore's mind.[90]

Related to ongoing research in the area of human cognition is the recent work of the experimental psychologist, J. C. R. Licklider, on the design of an advanced system which would intervene between a given corpus of recorded information and the cognitive structure or map which an individual seeking knowledge brings with him to the interaction with a body of knowledge. The thesis seems to be that it is easier to organize information for transmission to individuals with unique cognitive structures than to attempt to reorient cognitive structures to a statically organized body of information. Such a system, called by Licklider a procognitive system, would permit a process of negotiation between the cognitive structure of the information seeker, as target, and a body of information with a given initial organization. In all likelihood, such a system would consist of some linkage between a computer with a very large random access storage capacity[91] and a teaching machine and, of course, the sources of knowledge generation.[92] Unlike conventional library and information systems, the units of discourse in this design would be conceptual and factual knowledge, not the physical artifacts or documents within whose bounds knowledge is constrained and arbitrarily organized only in terms of the cognitive system of the author and those who are on the

[89] See Donald M. MacKay, "Communication and Meaning—A Functional Approach," in Northrop and Livingston (eds.), *op. cit.*, pp. 168-70.

[90] Herbert A. Simon and Allen Newell, "Information Processing in Computer and Man," *American Scientist*, LII (1964), 281-82.

[91] Serial access computer memories have storage capacities which are roughly one thousand times greater than random access memories. In terms of access speed, however, random access memories are about ten thousand times faster than serial access memories.

[92] The console of the procognitive system would, therefore, have buttons labeled respectively "Where am I?" and "What should I do next?" These buttons would enable the knowledge seeker to negotiate a *rapprochement* with the body of recorded knowledge through the conceptual good offices of the intermediate procognitive system itself. See J. C. R. Licklider, *Libraries of the Future* (Cambridge: MIT Press, 1965), p. 127.

same wavelength with him.[93] Defining solid information as that which excludes popularizations, ephemera, and unqualified contributions, Licklider has predicted that the increasing size of high speed random access computer memories by 1985 will permit, despite prodigious growth in the body of recorded knowledge, a procognitive system user to interact simultaneously with the solid literature of a subfield of science and technology, with a scientific or technical discipline by 1988 or 1989, and with all of science and technology by 1996.[94] This assumes, of course, that an adequate mechanism for knowledge organization can be developed with sufficient versatility by those dates. It is interesting to note, however, that a subcommittee of the Federal Council for Science and Technology, known as the Committee on Scientific and Technical Information, is planning a national information system which embodies two distinct but related subsystems. There is to be a library subsystem (consisting of a complex of libraries) which is document-oriented, and an information subsystem (directed to the evaluation, storage, and retrieval of information *per se*). The library system would satisfy the requirements of those who seek humanistic and some forms of social science knowledge and who are interested in nonscientific ideas. The information system would provide natural scientists and most social scientists with conceptual and factual information.[95] Another development of interest in the organization of knowledge (as recorded knowledge) is the SYNTOL (Syntagmatic Organization Language), a general system developed by Jean Gardin in France between 1960 and 1962 and currently applied to a set of brief abstracts in the field of cultural anthropology. In this system, there is a paradigmatic organization in which relations are established a priori between index terms which have been developed out of a general surveillance of the fields involved, but which are not derived from any specific document. The strategy employed in developing the paradigmatic dimension of the system is not unlike that used in constructing an a priori classification scheme. The syntagmatic dimension of the system, unlike the paradigmatic, is a posteriori—that is to say, based on relations between terms which have actually been found in the documents of the fields involved.[96] The

[93] Compare, for example, the imaginative speculations of Licklider, *ibid.*, pp. 21-69, with the less sophisticated extrapolations of John Kemeny in his "A Library for 2000 A.D.," in Martin Greenberger (ed.), *Management and the Computer of the Future* (New York: MIT Press and Wiley, 1962), pp. 134-177, where the library is seen as continuing to contain mainly physical artifacts (like books and periodicals); where the library is conventionally classified; and where information access is assured, by and large, through refinements in presently existing technology. It certainly can be speculated that scientists operating on the leading edges of theoretical research prefer informal or nonbibliographical channels of communication for reasons other than the time lag between the germination of an idea for an article in the mind of a scholar and the formal entry into the public domain of science via the published article ultimately embodying the idea. The feedback incorporated in interpersonal interaction (whether orally or through correspondence) cannot be duplicated in the interaction between a scholar and the formal publications of a colleague. Scholars are likely, for example, to be more speculative, to risk more, and to be less circumspect with regard to the dimensions of their thought in an informal situation. That is why there is a need to formalize the informal means of communication without, at the same time, eliminating the informal which makes these channels so viable. Russel Ackoff has in mind, as I understand it, a project which would formalize certain aspects of the intellectual interaction in the "invisible colleges" identified by Derek DeS. Price in his *Little Science, Big Science* (New York: Columbia Univ. Pr., 1963). See also the discussions of informal communication in William D. Garvey and Belver C. Griffith, "Informal Channels of Communication in the Behavioral Sciences: Their Relevance in the Structuring of Formal or Bibliographic Communication," in Bergen (ed.), *op. cit.* and Richard H. Orr and Associates, "Communication Problems in Biomedical Research: Report of a Study," *Proceedings of the Federation of American Societies for Experimental Biology,* XXIII (September-October 1964), 1117-32.

[94] See Licklider, *op. cit.*, pp. 13-20.

[95] William T. Knox, "The Changing Role of Libraries," *ALA Bulletin,* LIX (September 1965), 720, 724.

[96] As I understand it, the syntagmatic dimension of SYNTOL bears at least some resemblance to the concept of associative indexing suggested by Lauren Doyle in his "Semantic Road Maps for Literature Searchers," *Journal of the Association for Computing Machinery,* VIII (1961), 553-78. It also seems related to the concept of faceted classification favored by the Classification Research Group in England and by the Indian classificationist Ranganathan.

SYNTOL is, therefore, both precoordinate and postcoordinate in character. My understanding of this system is limited and imperfect, but it is supposed to be capable of concept coordination.[97] In discussing the system, Victor Yngve has foreseen the possibility of revising, reorganizing, and updating the paradigmatic component on the basis of the ongoing development of the syntagmatic component, linked as it is with the ongoing development of knowledge as incorporated in actual documents. Drawing an analogy between the paradigmatic dimension and innate knowledge and the syntagmatic dimension and acquired knowledge, he suggests that "one can imagine a learning method by which syntagma that are collected—acquired from new documents, in this case document representations or surrogates—would be abstractly incorporated in the paradigmatic, innate structure, subject to certain conditions of acceptability. In this way the 'culture' of the computer would continually be extended, reorganized, updated, under the impact of the recent scientific data found in the newly processed literature."[98] This conversion of syntagmas into paradigms finds its analogue, it appears, in the modification of empirically based concepts on the basis of new experimental evidence, or the modification of very general concepts on the basis of new found correlations among its components—the empirically based theories. Obviously, systems like the procognitive and the SYNTOL are ready-made for the involvement of general systems theory. General system principles could serve as organizers in the procognitive system and as specifiers of knowledge relationships in the paradigmatic component of the SYNTOL. These possibilities will be discussed more fully later in the paper.

Prior to discussing the implications of general systems theory for librarianship and higher education in any great detail, it might be well to devote some space to a general consideration of models, theories ,and concepts. A brief treatment should suffice here. There are, of course, many different kinds of reasoning: the mathematical or logical (with its internal aesthetic and independence of empirical reference); the scientific (which also may be deductive, but which makes empirical referents imperative); and the philosophical (which may also be deductive, but which is concerned with ultimate meanings and is frequently prescriptive or normative in character).[99] Robert Morton, the advocate of "middle range" theory in sociology, has identified the functions of broad theory or paradigms as: (1) notational (including economy in the logical incorporation of lower-level theories); (2) logical (in the sense that they prohibit the incorporation of logically irresponsible hypotheses); (3) cumulative (in their support of knowledge cumulation); (4) heuristic (in their guidance of the definition, investigation, and solution of problems); and (5) organizational (in their ability to codify knowledge).[100] An excellent definition of theory is that recently formulated by Karl Deutsch and Leroy Rieselbach. They write:

To the Greeks, *theoria* meant the passionate contemplation of reality; to the modern scientist, theory means an abstract, symbolic image or model of relevant aspects of reality—a model which may or may not be capable of being imagined in visual terms, but which in any case permits the

[97] For a basic elaboration see Susan Artandi, "SYNTOL—A New System for the Organization of Information," *Library Resources and Technical Services*, IX (Fall 1965), 473-75, 477. For a more extensive treatment, see J. C. Gardin, *SYNTOL* (New Brunswick, N.J.: Graduate School of Library Service, Rutgers-The State University, 1965).

[98] Gardin, *op. cit.*, pp. 95-96.

[99] See Belth, *op. cit.*, pp. 8-11.

[100] Robert K. Merton, *Social Theory and Social Structure* (rev. and enl. ed.; Glencoe, Illinois: Free Press, 1957), pp. 5-6, 14-15. See also Belth's delineation of the functions of theory, in Belth, *op. cit.*, pp. 29-30.

orderly retention and recall of relevant memories from the past, and the forming of relevant and, as far as possible, dependable expectations for the future. Every theory is then in principle an engine for the selection of information as well as for its storage and retrieval, and for the making of predictions. If it is an open theory, rather than a closed one, it will also be an instrument to start or extend the search for new information, and for the dissociation and recombination of old and new information into patterns by means of which the original theory itself may be extended, transformed, or replaced by a new one. And, of course, if it is a scientific theory, it will be susceptible to testing by operational evidence, that is, by evidence obtained by standardized and impersonally reproducible procedures.

The foregoing, it seems,[101] summarizes in extremely cogent terms the manifold functions of theory.

Theory is often, as Deutsch and Rieselbach indicate, cast into the form of a model.[102] Abraham Kaplan has described models of all kinds as the "embodiment of a structural analogy" in which the elements and their relations in the model are such that something may be learned about the system to which the model is seen to correspond.[103] Verbal models, which seek to explain the unfamiliar metaphorically in terms of the familiar, pervade even day-to-day human intercourse. Such attempts at horizontal explanation are, however relatively ineffectual at those dimensions where familiar analogues no longer exist, for example, at 10^{-13} centimeters or a billion light years. It is at these extremities of size and distance that mathematical models carry man out of his anthropomorphic dilemma.[104] Good models often permit the identification of those components of empirical reality which it is most important for man to measure. Of the several functions performed by theories and models, the most important from a general systems point of view are probably the organizational, the explanatory and the heuristic-predictive. It is in these functions particularly that theories and models serve as intellectual machine tools.[105] The interaction of the organizational and heuristic functions of models and theories have been described in feedback terms—the organizing power is heuristically suggestive and it expands as the effects of problem solving pay off in new insights regarding the knowledge which is organized by the model or theory.[106]

Having devoted some space to the treatment of models and theories, it may be worthwhile at this point to consider

[101] Karl W. Deutsch and Leroy N. Rieselbach, "Recent Trends in Political Theory and Political Philosophy," *Annals of the American Academy of Political and Social Science,* CCCLX (July 1965), 140. See also Karl W. Deutsch *The Nerves of Government: Models of Political Communication and Control* (New York: Free Press of Glencoe, 1963), pp. 6-8.

[102] Abraham Kaplan has argued that not all theories are models since "the theory states that the subject matter has a certain structure, but the theory does not therefore necessarily *exhibit* the structure itself." See his *The Conduct of Inquiry: Methodology for Behavioral Science* (San Francisco: Chandler, 1964), pp. 264-65. See also Belth, *op. cit.,* pp. 30-31, 179-80.

[103] In very broad terms, system X is a model of system Y if by using X one can learn more about the structure and function of Y without directing any special attention to direct or indirect causal relationships between the two systems. Kaplan, *op. cit.,* pp. 263, 266-67. See also Belth, *op. cit.,* p. 88.

[104] Warren Weaver, "Scientific Explanation," *Science,* CXLIII (March 1964), 1297-1300. Also Belth, *op. cit.,* p. 89. Herbert Simon has argued additionally that mathematical models, by virtue of their ease of manipulation, provide their employers with certain psychological advantages. See his "Models: Their Uses and Limitations," in Leonard White (ed.) *The State of the Social Sciences.* (Chicago: Univ. of Chicago Pr., 1956), pp. 71-72.

[105] Karl Deutsch uses the image of the safecracker's kit, filled with the tools of his trade, to suggest the importance of the intellectual's possessing an array of theories and models for the organization of reality, or intellectual safecracking. See his "Higher Education . . ." in Bryson *et al., op. cit.,* p. 133. In physiology, the concepts of organ and organ function served as heuristic devices, in that prior to the employment of these concepts there was little really certain knowledge about the structure and function of organs in a complex organism. See Joseph J. Schwab, "The Concept of the Structure of a Discipline," *Educational Record,* XLIII (July 1962), 198. See also Nash, *op. cit.,* p. 369.

[106] For an excellent treatment of this phenomenon, see Nash, *op. cit.,* pp. 87-88, 248-49, 269. Gyorgy Polya's notion of the science of heuristics is discussed in Polanyi, *op. cit.,* pp. 127-128.

general systems theory in its relationship to what has gone before. Many readers are undoubtedly familiar with the general outline of the development of the systems or holistic approach from the excellent discussion contained in Ludwig von Bertalanffy's book, *The Problems of Life: An Evaluation of Modern Biological and Scientific Thought;*[107] with the activities of the Committee on the Behavioral Sciences at the University of Chicago through 1954; with the subsequent work done at the Mental Health Research Institute at the University of Michigan; and with the systems research conducted at a number of institutions, often under the title of operations research. The idea of general systems theory, as formulated by von Bertalanffy, goes back at least to the 1930's. It is the holism of the systems approach which no doubt appeals to its many adherents. René Dubos has vividly contrasted this approach to reductionism in the following passage:

> The reductionist and holistic approaches to human problems are well symbolized, it seems to me, in two beautiful portraits of scientists, one by Franz Hals, the other by Rembrandt. The portrait by Franz Hals is a painting of René Descartes, in the Musée du Louvre. It conveys the clarity and vigor of orthodox science, confident in the power of its analytical method. The intellectual assurance of the experimenter arises from the fact that he has learned to deal with simplified systems, representing selected aspects of the world rather than total reality. The portrait by Rembrandt is an etching in the Philadelphia Museum of Art, depicting a physician who has just seen a sick person. His attitude, at the same time perplexed and reflective symbolizes the bewilderment and awe experienced by any thoughtful scientist coming face to face with the problems of the body and the mind of the throbbing men in direct contact with life as it occurs in nature. Rembrandt's doctor seems hesitant, yet eager to grasp the real meaning of total experience.[108]

The systems approach has been found useful in so many different domains of inquiry that David Easton recently characterized it as "one of the thunderous concepts of the century."[109] As a unit of discourse, the modern notion of system implies more than did the classical concept of system. It implies that the whole is greater than the sum of its parts. General systems theory of course is based on the belief that system elements and behavior is controlled by processes which, if not tightly analogous —that is to say, homologous—are at least in some way isomorphic.

One of the major difficulties with the systems approach, it would appear, however, is the real danger it poses for committing what has been called the "fallacy of misplaced concreteness," that is to say, the confusion of invisible, theoretical entities with concrete, observable ones.[110] This raises an important question: Are systems, viewed as sets of physical or conceptual entities whose attributes have some kind of relationship to one another, really present in nature or is the notion of system simply an artificial construct which is imposed on nature to aid human understanding? The answers to this question vary depending on whom one consults. In the judgment of A. D. Hall, system seems to imply an artificial construct since one somewhat arbitrarily determines—on the basis of one's interests and the problem at hand—which elements are to be included in a system, which elements are to be excluded from it, and, finally, which intrasystem and system-environment relationships are going to be observed. The set of physical or conceptual entities which comprises

[107] New York: Harper, 1960.

[108] René Dubos, "Logic and Choice in Science," *Proceedings of the American Philosophical Society,* CVI (October 1963), 374.

[109] David Easton, *A Framework of Political Analysis* (Englewood Cliffs, N.J.: Prentice-Hall, 1965), pp. 24-25.

[110] Caws, *op. cit.,* p. 285.

a system, therefore, is left largely to the observer.[111] On the other hand, Michael Polanyi has written: "The most daring feats of originality are still subject to this law: they must be performed on the assumption that they originate nothing, but merely reveal what is there."[112] The British anthropologist, A. R. Radcliffe-Brown, arguing from what he describes as the Aristotelean-Ephesian concept of natural law, regards systems as imminent in nature, that is to say, there from the beginning of time. He reaches this conclusion after considering and rejecting the Newtonian (law as imposed on reality by God); positivist (law as a statement of something that has been observed); and pragmatic (law as a generalization that works in the world) concepts of law.[113] Within this perspective, therefore, systems can be isolated from one another, and the observer should be able to distinguish, for example, between a political system and an economic system. The individual disciplines, moreover, can be identified by the classes of systems with which they deal. For Radcliffe-Brown, conceptual systems conformed with the systems of natural reality.[114] David Easton, on the contrary, objects to the notion of natural systems and presents strong arguments to buttress his view that system is a construct imposed upon nature as a matter of theoretical convenience. Looking at systems from the viewpoint of a behavioral scientist, Easton admits that in the physical and biological sciences systems may seem quite natural in that they are generally coherent and possess what seem to be clearly defined boundaries. Social systems, however, seem much less naturally coherent and bounded. Even biological systems, claims Easton, have boundaries which are something less than completely defined. Cytologists, it seems, have difficulty during certain parts of analysis in differentiating the epidermal cells from the air which surrounds them. In his view of systems, the political system, as construct, is defined by institutions which "are more or less directly related to the authoritative allocation of values for a society."[115] Institutions which cannot be included within the domain of this definition constitute the parameters or environmental givens of the political system. Systems as constructs are, therefore, neither true nor false, but are simply more or less useful or contributive to our understanding of the phenomena under investigation. There are, of course, undertones of pragmatism in a view which orients to reality on the basis of utility, but it avoids controversy over what is really a system, a difficulty which would be inevitable in the natural systems point of view.[116] It seems possible to relate both views of system—the natural and the artificially constructed—to Whitehead's metaphysics of organism in which all entities, human and nonhuman, are social and possess the quality of sympathy for one another.[117] The difficulty set out above is probably why James Miller, in his recent report on behavior in living systems, was careful to distinguish conceptual, abstracted, and concrete systems. Differentiating abstracted systems from conceptual systems by suggesting that the former are more likely to have empirically determined components, Miller argues that the unification of the sciences would proceed more rapidly if all of the sciences were oriented to either con-

[111] See A. D. Hall, *A Methodology for Systems Engineering* (Princeton, N.J.: Van Nostrand, 1962), pp. 60-61.

[112] Polanyi, *op. cit.*, p. 130.

[113] A. R. Radcliffe-Brown, *A Natural Science of Society* (Glencoe, Ill.: Free Press of Glencoe and Falcon's Wing Press, 1957), pp. 13-14 and 19-20.

[114] *Ibid.*, pp. 23-24. See also Easton, *op. cit.*, p. 28.

[115] Easton, *op. cit.*, pp. 65-66.

[116] *Ibid.*, pp. 27-30, 33-34, 44-45, 64-66.

[117] See Alfred North Whitehead, "Process and Reality: An Essay in Cosmology," in F. S. C. Northrop and Mason W. Gross (eds.), *Alfred North Whitehead: An Anthology* (New York: Macmillan, 1953), pp. 567-84.

crete or abstracted systems.[118] Concrete systems, it is important to note, can most generally be ordered hierarchically according to their complexity, an observation not at all startling when one recalls that the world evolved toward complexity from simplicity.[119]

In order to reorganize knowledge for transmission in the educational process, and to develop library systems which are supportive of that reorganization, some decisions must be made about what knowledge is important and what is not.[120] It is the writer's view that economic structure is all-important and that, to quote Boulding, "if a single theoretical principle can be shown to apply over a wide area of the empirical world, this is economy in the learning process."[121] The economy provided higher education by such metatheories is important to contemplate in view of the complaints about the length of the typical undergraduate, graduate, and professional programs and what, in my judgment, are the pseudo-complaints of faculty members about "having too much material to cover" and the "explosion of knowledge."[122] The organization of knowledge is the key to the problem and it rests, by and large, on the "set of related definitions, assumptions, and propositions which deal with reality as an integrated hierarchy of matter and energy."[123] For a general systems theory to develop fully, great care must be exercised in identifying isomorphic system principles. And analogies must be carefully drawn between theoretical systems which have empirical linkages.[124] It is one of the great beauties of general systems theory that it is free to identify isomorphism in the principles which are operative in social, as well as physical and biological systems.[125] The randomness, uncertainty, and organized com-

[118] James G. Miller, "Living Systems: Basic Concepts," *Behavioral Science,* X (October 1965), 202, 204, 207. Easton has been inclined to make a similar differentiation between behaving systems and symbolic systems, *op. cit.,* p. 26. Parsons has distinguished theoretical (what Miller might be inclined to call abstracted) systems from empirical systems. He writes: "Methodologically, one must distinguish a theoretical system, which is a complex of assumptions, concepts, and propositions having both logical integration and empirical reference, from an empirical system which is a set of phenomena in the observable world that can be discovered and analyzed with a theoretical system." Talcott Parsons, "Social Systems and Subsystems," in David L. Sills (ed.), *International Encyclopedia of the Social Sciences* (New York: Free Press of Glencoe; in press). The citation is to p. 1 of the mimeographed version of the article.

[119] Simon reasons that our ability to hierarchically order empirical systems is based on the fact of the dynamics of intrasystem interaction. See his "The Architecture of Complexity," *Proceedings of the American Philosophical Society,* CVI (December 1962), 477, 481-82. See also Kenneth Boulding, "General Systems Theory—The Skeleton of Science," *General Systems,* I (1956), 13-16, and Charles Morris, *Signification and Significance: A Study of the Relations of Signs and Values* (Cambridge: MIT Press, 1964), pp. 20-21.

[120] This is a principle, suggests Richard McKeon, of which "the philosophers of Greece, the summists of the thirteenth century, the universal men of the Renaissance, and the polymaths of the eighteenth century" were well aware. Se McKeon in Cohen, *op. cit.,* p. 174.

[121] Boulding, *The Image: Knowledge in Life and Society,* pp. 162-63. Alvin Weinberg has expressed his concern that university science, and the elementary secondary school science curricula which university scientists are helping to shape, overemphasizes the specialized search activities of pure science at the expense of the important and legitimate scientific function of codification. See his "But Is the Teacher also a Citizen?" *Science,* CXLIX (August 1965), 603-604.

[122] It is my intuitive notion that the phrase "explosion of knowledge" is in some respects a myth. To be sure, there is a gradual expansion of basic or fundamental theoretical knowledge, but there is by no means an explosion of deductively fecund conceptual systems. What there seems to be is a publication explosion reflecting the exponential increase in knowledge which is crudely empirical or of low theoretical order.

[123] Miller, "Living Systems . . . ," *op. cit.,* p. 193.

[124] Kenneth Boulding has reminded us that analogies are only as good as the empirical linkages to the theoretical systems from which they are drawn. See his "General Systems as a Point of View," in Mihajlo Mesarovic (ed.), *Views on General Systems Theory* (New York: Wiley, 1964), p. 32.

[125] Early attempts at identifying general theories, based on the isomorphism of lower order generalization, led, for example, to the observation that the exponential law of mathematics applied to a range of behaviors from radioactive decay to the death rate of bacteria under certain conditions to the rate of decrease in human and animal populations where the mortality rate exceeds the birth rate to (it might be added) the growth rate of the literature of science. Now James Miller has developed some one hundred and sixty-five different hypotheses which are cross-level in the sense that they apply to the behavior of living systems at different levels of complexity. It is interesting to note that in the process of developing these hypotheses, Miller also identified discontinuities like longevity, size, and diffusion. He has employed matter, energy, and information as his fundamental analytical concepts. See his "Living Systems: Basic Concepts," *op. cit.,* pp. 193, 216; his "Living Systems: Cross-Level Hypotheses," *Behavioral Science,* X (October 1965), 380-411; and, finally, his "Living Systems: Structure and Process," *Behavioral Science,* X (October 1965), 337-79.

plexity present in all three kinds of systems render them open to the application of mathematical methods which were unnecessary in classical, mechanistic science.[126] In the process of identifying metaprinciples, general systems theory can be said to be combatting entropy at a very high level. The operations of imagination, correlation, and systematic thought which go into the identification of such general theories of systems result, it has been suggested, in the creation of new information or negative entropy. Therefore, the "form" in the word information is precisely what it suggests, that is to say, formative and structural.[127]

What are the prospects for general systems theory as a curricular integrating principle in undergraduate, and perhaps even graduate level, general education? Boulding already teaches a course entitled "General Systems" to honor seniors at the University of Michigan. In this course, general systems is presented as a point of view rather than a set of techniques. The course objectives seem to follow a perspective on general systems theory shared by Boulding with von Bertalanffy. The course prospectus reads as follows:

The object of this course is to examine the general structure of theoretical systems in many different branches of learning, with a view to establishing relationships among the theories which pertain to various empirical subject matters. By so doing it is hoped that the student will come to appreciate certain basic unities which underly the universe of knowledge.[128]

In discussing the relationship between systems theory and systems research as two elements in a systems science, Russell Ackoff projects a different point of view. As early as the 1950's, he expressed his concern about the excessive generalization, operational insignificance, and almost metaphysical point of view which he thought pervaded the systems movement.[129] Ackoff suggests that where systems theory seeks to identify theories with cross-disciplinary generality, systems research views knowledge as a product of the application of scientific method applied not to phenomena defined by disciplines but to nature viewed holistically, typically in terms of some problem. He would argue that nature does not share the disciplinary organization of universities and that for systems theory to accept such arbitrary divisions is a constraint on its proclaimed holism. For Ackoff the direction of abstraction vis-à-vis system principles is from the complex to the simple, not the reverse. He is unsettled about the apparent removal of systems theory from the empirical world—a two-stage removal if one considers general systems theories as inductively formulated on the bases of a common principle observed to be operative in a limited set of concrete systems. Therefore, Ackoff argues, more limited theories must be: (1) deduced from the general theories for application to newly identified systems; and (2)

[126] Like finality, equifinality, hierarchical order, and the like. Ludwig von Bertalanffy, *Problems of Life: An Evaluation of Modern Biological and Scientific Thought* (New York: Harper, 1952), pp. 189-90, 199, 202. Also his, "General Systems Theory—A Critical Review," *General Systems*, VI (1962), 2.

[127] See Miller, "Living Systems: Basic Concepts," *op. cit.*, p. 194; Henry Quastler, *The Emergence of Biological Organization* (New Haven, Conn.: Yale Univ. Pr., 1964), pp. 3-4; and Leon Brillouin, *Scientific Uncertainty, and Information* (New York: Academic Press, 1964), pp. 17-18, 21. For a discussion of the analogy between the linguistic theory of Noam Chomsky and the tiered way in which one can view the structure of science, see Israel Scheffler, *The Anatomy of Inquiry: Philosophical Studies in the Theory of Science* (New York: Knopf, 1963), p. 7. Of particular interest is the analogy between grammatical units of cross-linguistic relevance (for example, nouns) and the structural terms of science (for example, theory) which have cross-disciplinary application.

[128] Prospectus for General Systems (College Honors 498), taught by Kenneth Boulding at the University of Michigan. One scholar has observed that the symbiosis between a professor and undergraduates who lack a full initiation into the ethos of the discipline which he represents can result in a critical examination of the formal foundations of the field, which the symbiotic relationship between a professor and his graduate students or professional colleagues might never elicit. See Richard Wolfgang, "Pure Research, Cultism, and the Undergraduate," *Science*, CL (December 1965), 1564.

[129] Russell L. Ackoff, "Games, Decisions, and Organizations," *General Systems*, IV (1959), 145.

either validated or invalidated empirically. In sum, however, Ackoff sees good work ongoing in systems theory as well as systems research and seems to suggest that a viable systems science may well require activity in both domains.[130]

It is apparent that both systems theory and systems research can contribute to a systems-oriented undergraduate program of general education. It is of concern in some quarters, however, that general systems theory, especially when it is viewed as a set of postulates or inductively determined theories from which more limited disciplinary theories can be derived and checked against reality, is open to the logical fallacy of affirming the consequent. In the logic of science it can be maintained that a system principle derived from a more general theory of systems is falsified—and with it the general theory of systems—if it does not agree with empirical reality; and it is confirmed, without really confirming the general systems principle, if it agrees with the empirical world. The logic of *(a)* falsification and *(b)* confirmation is as follows: (a) If Y, then X; X is not the case, therefore, Y is not the case and (b) If Y, then X; X is the case, therefore, Y is the case. However, in the process of confirmation, if X is the case, Y may not necessarily be uniquely the case. Therefore, one observes formal validity where there is falsification and formal invalidity where there is confirmation. This is so because the confirmation of X (a logically derived disciplinary theory which has been deduced from a general theory of systems) does not guarantee that Y (the general theory of systems) is uniquely the case. It is entirely possible, for example, that a different general theory of systems, Z, could also logically give rise to the disciplinary theory X. In brief, if Y then X; X is the case; but also Z then X; X is the case.[131]

The theories and concepts which are employed in systems activity are an interesting lot to observe and compare.[132] Alfred Kuhn's attempt to unify the knowledge centered in sociology, political science, and economics resulted in the development of concepts like decisions, communications, transactions, organizations, and their combinations.[133] Ackoff speaks of theories of allocation, queuing, sequencing, routing, replacement, competition, and search and discusses gaming and sequencing in his book, *Scientific Method: Optimizing Applied Research Decisions.*[134] The role of mathematics is clear from the frequent mention of Bayesian statistics and Monte Carlo method. Of inventory theory, Ackoff writes:

> Within the industrial context, inventory theory can be applied to such diverse phenomena as the acquisition and use of operating capital, the hiring and training of personnel, and the determination of how much and how frequently to acquire productive capacity. It is also applicable to any type of input-output system to which benefits and losses can accrue. For example, the metabolic processes of a living organism can be studied as an inventory process, the operation of a heating system, a computing center, a documentation center, and the natural water system of a geographical region. The inputs, outputs ,and systems involved can be of relevance to any and every scientific discipline. The disciplinary

[130] Russell L. Ackoff, "General Systems Theory and Systems Research: Contrasting Conceptions of Systems Science" in Mesarovic (ed.) *op. cit.*, pp. 51-60. This is obviously, as Anatol Rapoport has pointed out, a task for the philosophy of science. See his "Reflections on General Systems Theory," in Mesarovic (ed.) *op. cit.*, p. 171.

[131] The foregoing is based on a discussion of portions of F. S. C. Northrop's *The Logic of the Sciences and the Humanities*, in William P. Ehling, "Toward an Epistemological Integration of Science: A Review of Models Developed in Operations Research, Communications Research, Systems Research, and Cybernetics" (Communications Research Studies in "Epistematics" [Syracuse, N.Y.: Information Science and Communication Management Program, School of Journalism, Newhouse Communications Center, Syracuse Univ., 1965]), pp. 20-22 (Mimeographed).

[132] O. R. Young, "A Survey of General Systems Theory," *General Systems*, IX (1964), 61. See also Deutsch, "Higher Education . . . ," *op. cit.*, p. 66.

[133] See his *The Study of Society: A Unified Approach* (Homewood, Ill.: Dorsey, 1963).

[134] Ackoff, *op. cit.*, pp. 46-47, 134-35.

characteristics of the relevant variables have no relevance to the theory.[135]

To continue, von Betalanffy has spoken of the exponential law and Gaussian distribution. And O. R. Young, in his overview of general systems theory, develops a taxonomy of concepts employed in systems theory which includes equifinality, state-determined system, goal-changing feedback, overload, and ultrastable system.[136] In Miller's general systems behavior theory are to be found concepts like passive adaptation, improbability, irregular simplicity, and extremum adaptation.[137] It is not clear at all times which of these many concepts reflect general system principles and which reflect methodologies or techniques which have very wide application. Most, however, seem to share a mathematical formulation, and some preparation in mathematics would seem to be rather central to a curriculum based on general systems theory.

A number of concerns would have to be reflected in a collegiate curriculum based on general systems theory. A central problem would be the historic role of archetypes and themata in the organization of humanistic and scientific knowledge respectively, and of the possible association of archetypes and themata in some general theory of symbolic structure which would comprehend the humanities as well as the social and natural sciences. Such a theory might profit from the close study of ancient religious systems out of which, Parsons and others have suggested, differentiated secular knowledge sprung. Then too, some sense of the cyclic rise and fall of archetypes and themata could sensitize students to what are likely to be the dominant organizing images during their lifetimes. The paired opposites which are reflected in archetypes and themata may even suggest a kind of systematic complementarity which would lend credence to Floyd Matson's belief that in the physical principle of complementarity lies "the immense evocative analogy" so pregnant with implication for the social sciences and humanities.[138] Such a curriculum would have to consider the role of contemporary religion and its relationship to the theoretical structures of other academic disciplines in the Parsonian sense that it "comprises the matrix from which cultural institutions in general have differentiated, and remains the 'master' system in a cybernetic sense."[139] Such a curriculum, as a foundation for the study of general systems principles, should acquaint students with the historical evidence concerning the analogical suggestiveness of models like mechanism, organism, and evolution which diffused outward from their loci of origin to have great impact in other areas of academic endeavor. Such a curriculum might seek to investigate the relationships between themata and archetypes and general system principles themselves. Using Ackoff's distinction, such a curriculum could direct the student's attention to general systems theory in the classroom and to the strategies of systems research during frequent, controlled forays into the world apart from the classroom. It would seem important that the student have some sense of the operational importance (that is to say, the theory in action) of those general systems principles that he encounters in the more formal and abstract part of his education. Such a curriculum might, following the lead of Northrop and Margenau, explore the extent to which viable normative and ethical principles can be derived through the application of sci-

[135] Ackoff, "General Systems Theory and Systems Research: Contrasting Conceptions of Systems Science," in Mesarovic, *op. cit.*, p. 57.

[136] See Young, *op. cit.*, pp. 61-62.

[137] Miller, "Living Systems: Basic Concepts," *op. cit.*, pp. 201, 229.

[138] See Floyd Matson, *The Broken Image: Man, Science, and Society* (New York: Braziller, 1964), pp. 243-59, and von Bertalanffy, *An Evaluation of Modern Biological and Scientific Thought, op. cit.*, pp. 176-77.

[139] Parsons, in Sills (ed.) *op. cit.*, p. 26.

entific method. It should also be concerned with the extent to which the normative prescriptions of the world's major religions converge along some very general and abstract principles. In general, such a curriculum should not involve merely the search for general system theories. It should also be concerned with what Whitehead called the unstated, and often unexamined, assumptions which affect the way men view the world. Finally it would seem that in such a curriculum, general systems theory should be used less as a means to unify knowledge than as a mechanism for restructuring knowledge. Of course, the systems point of view would imply breadth of interest and a basic toleration of many different approaches to the development of a systems science.

It is fun to speculate on the kind of library system needed to support such a curriculum. In the first place, it would probably have to be both information-oriented and document-oriented. It would have to be an open system flexible enough to accommodate the shifts in relationship between metatheory and the empirically-based system principles which rise out of individual empirical realms. It would have to have both inductive and deductive capacities—that is to say, when presented with a principle observed to be operative in a specific system, it could provide both the general systems theory comprehending the specific system principle and concrete information regarding the empirical phenomena whose behavior the specific system principle comprehends. When interrogated with a general theory of systems, it would provide information on the different systems to which the principle had been found to apply and something about the smaller phenomenal entities which it organizes.[140] The design and construction of such a library system would, of course, require the collaboration of not only general systems theorists and librarians, but philosophers (especially epistemologists or philosophers of science), mathematicians, computer scientists, classificationists, and operations researchers as well.[141] And the efficiency and adequacy of such a system would, in all likelihood, be closely related to how well it remained current with the results of ongoing research in the systems sciences and how well its organizing mechanism supported the economy in knowledge transmission stressed in the curriculum itself.[142] ■■

[140] This raises the question of the relevance of general systems theory to the development of procognitive systems and to the refinement of the paradigmatic dimension of SYNTOL.

[141] Douglas J. Foskett of the English Classification Research Group strongly urges that systems of classification be developed which take into account advances in scientific thought and the philosophy of science. He has even suggested general systems theory as an area of some possible utility in classification research. See his *Classification and Indexing in the Social Sciences* (Washington: Butterworths, 1963), pp. 130-31.

[142] The English Classification Research Group has for some time considered the theory of integrative levels (or, put a bit differently, hierarchical systems) as a foundation on which to construct general classification schemes. The theory of integrative levels is based on the empirical observation that entities evolve from simplicity toward complexity and on the notion, advanced in the the theory of emergence discussed by Caws, that each successively complex whole is somehow greater than the sum of its parts. See *ibid.*, pp. 132, 134-35, 141, 143; and Douglas J. Foskett, "The Classification Research Group, 1952-1962," in his *Science, Humanism, and Libraries* (New York: Hafner, 1964), p. 200.

ROBERT F. CLARKE and HAYDEE GARCIA CLARKE

Repeat Photocopying of Journal Articles

When viewed in the perspective of total copying, repeated photocopying of articles from journals published in the United States does not appear to be of sufficient volume to warrant special attention from library administration. A study of 8,023 photocopies produced by photoduplication services of three different research libraries reveals that only 178 (2.2 per cent) represented two or more repeat copies. No article was copied more than four times during the period surveyed.

LIBRARY-OPERATED photoduplication services are an important means of disseminating information. Some libraries have used this means for many years to save their patrons from copying information by hand. Also, libraries have enabled distant patrons and other libraries to use their collections by providing photocopies through mail service. These photoduplication services follow the practice of filling individual requests for single copies as and when requested. Libraries place restrictions on the types of material which can be photocopied. Requests may remain unfilled for any one or more of the following reasons: journal issues are too tightly bound for photocopying, not yet received, on loan, not in the collection, in a deteriorated condition, at the bindery, missing, temporarily missing, not identified, in processing; or the requester fails to use proper request form, wants multiple copies, gives an incomplete citation, fails to include return address; or because of copyright restrictions, length of article, etc.

Dr. Clarke is Deputy Chief, Technical Services Division, National Library of Medicine. Mrs. Clarke is former Chief Medical Librarian, Hospital del Nino, Lima, Peru.

In operating a photoduplication service, the question of whether the same material is requested and photocopied more than once inevitably arises. The present paper reports on a survey of repeat photocopying of articles from journal titles published in the United States, as performed at three research libraries in recent years.

METHOD

The survey was conducted by examining records of three major photoduplication services located in large research libraries in the United States. The director of one of these requested anonymity for his library, thus all three must remain anonymous. Library A is a large research library located in a metropolis on the east coast. Library B is a research library famous for its holdings in science and technology. Library C serves a great midwestern university. All three photoduplication services receive requests from around the world.

All records for two peak months of photocopy activity, each one in different years, were examined at Library A. At Library B, the sample consisted of all requests filled in one year for randomly selected patrons and covered approxi-

mately 11 per cent of the year's total. A complete year of records was examined at Library C. These three types of samples were combined to give a rounded approach for the examination.

Findings

A total of 8,023 photocopies of articles was produced from the 1,318 different journal titles published in the United States. This represents a mean of 6.1 photocopies produced per journal title. The 8,023 photocopies actually represented 7,845 different articles copied, because 178 photocopies were repeats of articles which had already been copied once during the survey. This represents a mean of 5.9 articles copied per journal title. Only by noting the overlap in journal titles copied in common by the three libraries were the two means this high, for if overlap were not taken into account, the number of journal titles would be higher. This would then reduce the means. Repeat copies of the same articles amounted to 2.2 per cent of the total number (178 repeat copies from 8,023 photocopies produced). Clearly, repeat photocopying of the same articles from journal titles published in the United States does occur, and it occurs within the time periods of the samples examined. The 2.2 per cent repeat copying is not an impressive amount, and it is less so when one considers that it required totaling the copying from samples taken at the three libraries to achieve it. Further, the above means of 5.9 and 6.1 approximate each other, so that the mean number of articles photocopied per journal title approaches the mean number of photocopies produced per journal title, all for journal titles published in the United States.

Note that repeat copying would be greater than reported here, since patrons at times do request more than one copy of the same article at the same time, but the photoduplication services in each instance furnished only one copy, automatically cancelling requests for extra copies.

From the 165 different articles copied repeatedly, 154 (93.3 per cent) were copied twice, nine were copied three times (5.4 per cent), and two were copied four times (1.3 per cent). Four was the highest frequency of repeat copies found, even combining the copying from the three libraries. Those articles copied repeatedly appeared in 130 different journal titles from among the 1,318 (9.9 per cent) journal titles photocopied. Only eleven journal titles (see Table 1) had articles copied more than two times; this represents 0.8 per cent of the 1,318 journal titles. Note that forty-four of the 178 (24.7 per cent) repeat *photocopies* (not articles) were produced by a different photoduplication service than that which produced the "first" photocopy. In other words, if the other photoduplication service had not made the copy, there would have been no repeat copy of that article in this survey. There is a core list of articles in a core list of journal titles published in the United States which receive repeated photocopying. The size of this list of

TABLE 1.

Title of Journals Published in the U.S. Having Articles Photocopied More Than Twice During the Period Surveyed

Journal*	No. Times Article Copied
Chem. Eng. Science	3
Elect. Merchandising	3
Electronics Design	3
Glass Ind.	3
J. Amer. Oil Chem. Soc.	3
J. Applied Mechanics	3
J. Audio Eng. Soc.	4
J. Meteorology	3
Official Digest Fed. Paint & Varnish	3
Radio Electronics	3
Senior Scholastic	4

* Combined samples from three libraries.

articles and journal titles decreases with an increase in repeated photocopying. These articles are copied at more than one photocopy service.

Since 134 (75.3 per cent) of the 178 repeat copies were produced in the same library that made the first copy during this survey, the same photoduplication service tends to recopy the same article within the same time period more than another photoduplication service tends to copy that same article during its time period examined. Note that the holdings of the different libraries and their policies and practices can influence repetition; for example, having material at the bindery, with the associated practices and schedules. All libraries do not hold the same journals in common, nor do all libraries offer photoduplication services, nor are all photoduplication services major ones, like those examined. All these factors tend to reduce the probability of repeated copying.

The age of the articles copied repeatedly is also of interest (see Table 2). The ages ranged from less than one year since publication to a maximum of sixty-three years at the time of copying. Their mean and median ages were 8.0 and 6.5 years respectively, with the mode occurring between one and two years of age when a total of twenty-eight articles were repeatedly copied. Not enough information is available to state whether the same articles in journals published in the United States are repeatedly copied down through the years, but it is a possibility which might be investigated. Clearly, there is repeated interest today in articles published in journals in the United States ranging back through many decades, as well as in those published in recent years.

Implications

Repeated photocopying of articles from journals published in the United States occurs in library photoduplication services. When viewed in the perspective of total copying, however, it does not appear to be of sufficient volume to warrant special attention by library administration. This seems even more nearly true in considering the volume of this repetition involving producing more than a second copy. Copyright would restrict production of multiple copies of articles thus protected, particularly the production of more than one copy at one time.

TABLE 2.

Age of Articles Copied More Than Once During the Period Surveyed, Which Appeared in Journal Titles Published in the U.S.*

Age in Years	No. of Articles
0	4
1	28
2	24
3	5
4	6
5	13
6	11
7	8
8	7
9	6
10	10
11	6
12	1
13	3
14	7
15	1
16	1
17	4
18	5
19	1
20	1
21	2
22	1
23	2
24	1
28	2
32	1
34	1
36	1
41	1
63	1
Total	165 articles

* Combined samples from three libraries.

Stockpiling of extra copies of noncopyrighted journal articles which have been photocopied once, or more likely more than once, might be studied. This examination should be from the viewpoint of considering storage costs for items which may never be asked for again, as well as production costs, and relating them to the present practice of photocopying only on demand, albeit if sometimes repeatedly.

■■

OPTIMUM SIZE . . .

(Continued from page 357)

areas. These libraries will depend upon the centers for their published output as an important device for aiding in the evaluation, digestion, and manageable assimilation of the literature for which they are responsible.

In such a development, all libraries could approach the problems of optimum size and of division of subject responsibility confidently and rationally.

There is considerable evidence that the great research libraries—government, university, and private—are already making tentative shifts to prepare themselves for their proper roles in the network of collections and services which must eventually evolve if we are to solve our problems. The national libraries of medicine, of agriculture, and other remarkable concentrations of subject strengths in various government departmental libraries are becoming accepted as true national resource centers, as indeed they have long tacitly been. There is much talk about the establishment of regional branches throughout the country. The Department of Agriculture has had so-called branches for many years, but not on the scale suggested here. The Library of Congress, which established a science and technology division only after World War II, and of course has tremendous resources and capabilities, is a central point in this shift and will spearhead many of the costly experiments and programs necessary to achieve it.

University libraries, for the first time, are separating their research functions in separate buildings, foreshadowing coming changes in function. At least one of them, Yale University, is separating its science research materials and will concentrate them in a new building.

The former Midwest Inter-Library Center has changed its name, and, from all indications, its future role in the research library picture in the nation. John Crerar and the Linda Hall libraries are becoming increasingly national resources, rather than limited local or regional library features. In Great Britain, the national lending library of science is a well established, working entity, and plans for a national science reference library are well along.

In conclusion, it might be said that "optimum size" techniques may need to be related to a situation in the scientific literature and in scientific libraries, which show every indication of radical and extensive changes ahead. These changes will come very quickly, for the pace of achievements in new knowledge and in new literature, which demands these changes, give us very little time.

■■

JESSIE CARNEY SMITH

Library Enriches Precollege Experiences for Students

Experience is described using a task force of forty-one precollege students as library assistants under the auspices of the United States Office of Economic Opportunity. The students accomplished assignments usually given to college student assistants and in return clearly gained insight into library functions, activities, and services.

THE PRE-COLLEGE CENTER at Fisk University is one of six such centers in the United States. It was organized in 1964 by Educational Services, Incorporated, a leader in the development of excellent instructional materials in schools and colleges.

A major purpose of the program is to assist students from low income families, to increase the likelihood of their success in college. Open to all eligible high school seniors in Metropolitan Nashville, the program requires that students show evidence of the desire to improve themselves, have curiosity of an intellectual nature, and manifest the ability to pursue successfully a college career.

All funds for the program are supplied by the United States Office of Economic Opportunity with the expectation that experience in such programs will give capable students increased opportunities to work toward and attain their major goals in life.

Student participants are exposed to thought-provoking English and mathematics activities. The ultimate goal of such activities is to stimulate more constructive thinking, better speaking, improved reading, and greater insight into mathematical and English processes.

Dr. Smith is Librarian in Fisk University, Nashville, Tennessee.

The Pre-College Center faculty is composed of excellent teachers from local high schools and unusually capable students of Fisk University. Emphasis is placed upon securing faculty members who have: (a) excellent abilities in various subject matter areas; (b) skills in working with students democratically; (c) the ability to use the inductive teaching method; (d) ideas for developing exciting learning experiences; (e) the ability to stimulate provocative discussions and to involve all students in the learning process.[1]

The program was initiated in March 1964. Classes during the school year were usually held on Saturday mornings. During an eight-week summer session students lived on campus and attended classes daily. In addition, they attended concerts, plays, and exhibits, and took a variety of field trips.

At the end of the 1965 summer term, these students were permitted and encouraged to participate in a four-week training program which provided them actual work experiences for which they received remuneration. Eighty-four students were employed in offices on campus, with the library requesting that forty-one be assigned as library aides. It was felt that through these services

[1] Fisk University, "The Pre-College Center," Nashville, Tennessee, n.d.

the library could focus on solving some of its problems that required immediate attention, while at the same time providing desirable library orientation for those students who probably were not familiar with library practices. Moreover, it was hoped that the experience would stimulate the young people to do wider reading for pleasure and classroom assignments and learn to work independently in solving problems requiring use of the library.

As soon as the training program was announced, the library assessed its needs and determined which could be met through the use of people who might or might not have had experience in library work. Under job identification the following were cited:

1. typing book pockets and cards, order cards, and book requisitions;
2. opening and checking in new books;
3. reading shelves;
4. mending, repairing, and marking books;
5. cleaning furniture and polishing brass;
6. dusting, sweeping, and vacuuming;
7. alphabetizing and filing catalog cards;
8. assisting with inventory;
9. cleaning library carrels where materials were stored and disposing of waste materials.

After a two-day training period students were assigned to duties according to their capabilities as indicated in the evaluation of the results of their brief training. They were subsequently assigned to adult supervisors who would be responsible for assigning their specific jobs.

Very early in the work program it was evident that the majority of the students needed constant supervision in order to perform their various assignments. For the most part they were capable of satisfactory performance on their specific jobs, or they were shifted to more suitable jobs; however, they tended to be lax and sometimes failed to complete assignments without prodding. The students were agreeable and quite cheerful, and with proper stimulation they would complete jobs as assigned. Moreover, they seemed to enjoy carrying out most of the assignments. It was apparent that the problems that the students presented were problems that probably are characteristic of teenage groups. Three of the students who were especially good workers were retained and are now working as library assistants while studying at Fisk.

In addition to the contributions that these students made to the library, it was evident that there was mutual gain as result of such a program. Many of them displayed an active interest in reading and checked out library materials for home use. Others were interested in the books and materials that the library was discarding and asked if they might have these materials for personal use.

The majority of the students were originally unfamiliar with the kinds of materials that are provided in a library, as well as the organization of such materials for use. Their work at Fisk doubtless gave them a greater familiarity with the types of library resources and library organization than they would normally receive. As a result, it is hoped that they will have a greater and more lasting appreciation of libraries and will subsequently make greater use of them.

It can be concluded that Fisk University library and the library aides in the precollege training program have received mutual benefits. If these students have developed an increased interest in reading and in using the library, and if they have become sufficiently familiar with the organization of library materials to work independently in carrying out their assignments, they will ultimately receive the greater benefit as a result of the program. ■■

HELEN WHEELER

Community College Library 1965

Questionnaires were circularized to the librarians and presidents of 334 public, coeducational junior colleges. Among subjects explored were characteristics of junior college faculty members, their library awareness, teaching methods, library aspirations and frustrations. Replies from the presidents and librarians are compared, similarities in attitudes observed and differences noted. Also given are the qualifications sought by junior college presidents in prospective directors of their libraries.

In a continuing effort to study the progress of community college library programming, a brief multiple-choice questionnaire was sent to all community college library directors in February, 1965. The important area of faculty-library integration was selected for concentration. Later a questionnaire directed to the chief administrators of the community colleges whose library directors had responded explored their library attitudes and experiences. Assurance was given that the library directors, administrators and institutions would not be identified in any tabulation. The sixth edition of *American Junior Colleges* was utilized to provide a population of three hundred thirty-four public, coeducational junior colleges. Because there is no comprehensive listing of American community colleges, it was necessary to ask recipients to disregard the questionnaires if they considered that their institutions were not functioning as community colleges. Therefore, the response of two hundred thirty librarians (68.86 per cent) perhaps is not fully indicative of the extent of their cooperation and support. Of the two hundred thirty chief administrators contacted, one hundred fourteen (49.56 per cent) responded. (Although "chief administrator" may refer to community college president, superintendent, dean, etc., the term "president" will be subsequently used.)

Community college teachers as viewed by their library directors are members of faculties ranging in size from ten to three hundred twenty-five, with the average faculty size between twenty-five and fifty. Two institutions rely entirely on part-time personnel, but twenty-five are able to recruit all full-time teachers. Although 77 per cent of all of the teachers must meet some type of certification requirements, 64 per cent of these requirements can be satisfied on provisional or temporary bases. Forty-three of the two hundred thirty community colleges involved in this survey have faculties for which the master's degree is standard equipment, whereas the teachers of ninety-two have been pre-

Dr. Wheeler is Associate Professor of Library Science in the University of Hawaii. In 1963, as part of the doctorate at Columbia University, the writer asked community college librarians to describe their programs. The project became known as "The Community College Library; An Appraisal of Current Practice," available as University Microfilm 65-4755. A book entitled "The Community College Library; A Plan for Action," based in part on this work, was published by Shoe String Press, 1964.

pared mainly by education courses. More than half report that their only other teaching experience had been in high schools. Although the majority of faculties were characterized as stable (as opposed to transient) by the librarians, community college teachers as individuals seem headed towards other kinds of employment—so that the librarians were prepared to list their destinations readily: about 40 per cent left for positions in four-year colleges; 25 per cent shifted to other types of teaching; and 9 per cent went into or returned to business.

The master's degree in a subject specialization topped the list of characteristics considered desirable for an effective community college faculty member from the point of view of the librarian. So-called "library-mindedness" was second, followed by broad liberal arts undergraduate preparation. Other characteristics many librarians hoped for in their faculty were community-mindedness, ongoing professional activities, and education coursework. It is interesting to note that when asked the same question (What characteristics do you consider most necessary for an effective community college faculty member?), most presidents also ranked the master's degree in subject-matter specialization first, *but* community-mindedness and ongoing professional activities followed in that order.

It was not unexpected that community college library directors found their English departments to be more library-minded in teaching methods and attitudes than their science or business departments, although several social science departments were more library-minded than English departments. Relating their courses to the library program least were the mathematics, technical, and science departments. Ways that community college faculty actively block an effective library program most frequently included the making of assignments before notifying the library (70.43 per cent of the librarians reported this as being *the* most frequent technique), assuming nonexistent library skills on the part of the students, and failing to recognize the importance of *their* part in the teaching and conveying of library attitudes and experiences. Other techniques frequently cited were failure to recognize the difference between library orientation and library instruction, over-use of text material, and failure to take some responsibility for their part of the library collection.

One hundred eighty-four (80 per cent) of the community colleges have faculty library committees, although the library director is not always a member. He is chairman, however, of one hundred (54 per cent) of them. The great majority of the committees were appointed by the administration without involvement of the librarian. Librarians who considered their library committee ineffective and undesirable, or who were unable to characterize its main function as advisory were in the minority; on the other hand, many avoided this whole area of questioning. Those who detailed their opinions as to why the library committee was not entirely satisfactory described committees which met to formulate policy and administer the library, to evaluate for accreditation, or which were dormant, did not have enough time, never met, or were uninformed or apathetic.

When community college presidents were asked their *reasons* for having library committees, only a fraction replied, which suggests that it is regarded as traditional, or "the thing to do." Most of the specific reasons given by presidents for having faculty library committees related to structuring policy and selecting books. And yet almost all indicated in their replies to the next question that they would characterize their library committee's main function as ad-

visory. Most avoided the question of how the committee was established.

Almost all community college faculty regularly utilize reserve materials collections. Librarians reported only 17 per cent of their faculties as really misusing this technique, which is probably not a high percentage in public education today. A good proportion (72 per cent) were reported making assignments requiring use of the general book collection. About the same percentage recommend books regularly. But full utilization of the library staff as members of the teaching team is another matter—only about 39 per cent. Almost half of the community colleges have departmental faculty representatives. Likewise, about half have a substantial portion of the faculty working on advanced degrees.

The community college president's perception of his teachers, students, librarians, and library program is a revealing part of this picture of faculty-library integration. Fully 40 per cent feel that their faculties fail to utilize library resources in their teaching. In the opinion of the presidents, ways in which this failure manifests itself most frequently include "not requiring enough reading," being "one textbook people," "making too little use of the library," "failing to encourage student use," and having limited knowledge of the collection. Also, 75 per cent of the community college presidents characterize their new students' previous library experience as being inadequate for college work.

One hundred ten of the one hundred fourteen community college presidents ranked the master's degree in library science from an accredited school among the basic characteristics of the capable library director. Second only to it is "excellent references from previous employers." Other characteristics of importance to the presidents—in descending order of frequency—are professional post-library-school experience, ongoing professional activities, audiovisual training or experience, teaching experience, and administrative experience. Can this be interpreted to mean that the presidents consider audiovisual and teaching experience more important than library administrative experience in the library director they recruit? Of *least* importance in their criteria for the capable community college library director's qualifications are origin in the community, publications, youth, "personality," and residence in the community.

Perhaps a final word should be said about the library programs which these library directors have been able to develop. Considering the number of volumes in the book collection as one among several significant factors in the effectiveness of the library program, 74 per cent of the responding community college libraries have less than the twenty thousand books recommended by the Junior College Library Standards.[1] Of the six community college libraries having at least fifty thousand books, five are located in California. Another consideration of the Standards is the proportion of the student body which can be accommodated in the library at one time. Nineteen (8 per cent) of the community colleges meet the recommended 25 per cent of the full-time-equivalent student body.

This has been a brief report of demographic aspects of American community college library programs during the past year, with emphasis on their relationships to and with their faculties. It is not possible to make much interpretation of the data, but they may be useful in illuminating the contemporary picture. ■■

[1] American Library Association. Association of College & Research Libraries. "ALA Standards for Junior College Libraries," *College & Research Libraries*, XXI (May 1960), 200-206; *American Library & Book Trade Annual, 1961*. (New York: Bowker, 1960), pp. 125-32.

DOROTHY JOENS GLASBY

New Periodicals of 1966—Part I

PUBLICATIONS noted below have been selected from among the large number received as new titles in the Library of Congress. For the most part, they carry beginning dates which fall into the last half of 1965 or the first half of 1966.

Although it does not seem possible to note any particular "trends" in regard to the subject matter of the new periodicals, it would appear that there are more titles than usual in the fields of education and history. One can note, also, the beginning (and in some cases the ending as well) of quite a number of "little" magazines.

Scientific or technical publications which have not been annotated in any way (since their titles would seem to reveal their contents) are marked with an asterisk in the alphabetical section at the end of this listing.

AREAS, REGIONS. Appalachia, as an area designated as "depressed" by the federal government, is much in the news today. *The Appalachian South* reports on aspects other than the poverty of the region. Stories, poems, articles, art and craft reproductions and folk songs written by and about the mountain people will be included. The editors are convinced "that the mountain man has no cause to hang his head in shame" and that "if men know where they came from, and why, it raises the limits on where they may go." The magazine is not an expensive and glossy affair but it is rich in information and the heritage of the region and some of the articles and stories give much insight, inadvertently or otherwise, as to why "poverty" programs are sometimes not a great success in those particular hills.

Prepared jointly by the Office of Antarctic Programs of the National Science Foundation and the U.S. Naval Support Force (Antarctica) of the Dept. of Defense, *Antarctic Journal of the United States* describes progress in the planned, systematic exploration of Antarctica which the United States began some ten years ago. The new *Journal* supersedes the National Science Foundation's *Bulletin of the U.S. Antarctic Officer* and its *Antarctic Report* but retains the main features of both. Articles to be published will include scientific and logistic reports, accounts of collaborative activities in the United States, discussions of Antarctica by qualified authors and information on matters of current or historic significance. One realizes, in leafing through the *Journal*, that while the tools and methods of exploration may have changed since the Antarctic days of Richard Byrd, there is still a good deal of excitement and much to be learned at the South Pole.

ART, ARCHITECTURE. In 1964 the Museu de Arte e Arqueologia was founded at Brazil's Universidade de São Paulo and now *Dédalo* will be published semiannually to record the museum's activities and to describe its collections. *Art and Artists* is the latest in the series of similar periodicals by the same publisher (*Dance and Dancers, Films and Filming, Books and Bookmen,* etc.). Its first issue has a guide to art galleries, reviews of the art "situation" in various cities, and articles such as the one called "Pop as Mod."

Comic art has been called the "true pop art." It has, according to the editors of *The World of Comic Art*, raised a voice against tyranny, instructed the illiterate, mirrored the daily life and thought of the Western world. The publication is profusely illustrated, of course, and gives much biographical and historical detail about cartoonists and their works. The first issue includes glimpses, among other things, of old friends such as Moon Mullins and Peanuts and an article about George Cruikshank.

Mrs. Glasby is a Serials Cataloger in the Descriptive Cataloging Division of the Library of Congress.

The heavily illustrated *Highrise* is devoted to highrise construction and is designed to be a medium of expression and exchange and a forum for comment on the "whys" and "wherefores" of design and the purposes of a high rise building. Structures dealt with will be considered from three points of perspective—concept, construction, and comment. Issues of *Highrise* will present progress reports on current construction, ideas and planning for future construction, and many technical articles.

BUSINESS, INDUSTRY. *The Mississippi Valley Journal of Business and Economics* will consist of significant writing and research findings of faculty members in business administration and economics in the universities throughout the United States. Each issue will have several articles of theoretical and practical interest in the areas of accounting, economics, finance, management, marketing statistics and related fields. By contrast, *Business and Public Administration Student Review*, as the title indicates, will be student oriented and student administered. It will grant prime recognition to articles and papers contributed by graduate and undergraduate students and will also contain service articles and sections such as "Library Research" and "Job Placement Procedure."

Industrial development in America is the field of *AIDC Journal* (issued by the American Industrial Development Council). The initial issue includes "A Study of Speculative Industrial Buildings in the Eastern United States" and "Utilizing Mississippi's Negro Labor Potential in Manufacturing." The United Nations Centre for Industrial Development, in *Industrial Research News*, will disseminate information on the aims, organization, research programs, needs, problems, and achievements of industrial research institutes throughout the world. It is hoped that the *News* will assist in the process of establishing new institutes and in inspiring and improving those that already exist. By spreading the word of what is now being done, the Centre hopes it will help to avoid duplication of effort among the institutes. Of special interest to librarians are the directories (the first on the institutes of industrial research and technology of the Philippines) to be published in each issue.

EDUCATION. Great Britain's Dept. of Education and Science, recognizing that more than one view can be taken of developments in education, is issuing *Trends in Education* to report on current practices and current thinking. The department does not necessarily endorse all the ideas presented in the pages of its journal but it does feel that all of them are at least worthy of attention or consideration. The first issue of *Trends* has an especially interesting and well written article, called "At First Hand," on children's writing and also contains "Education for the Computer Age" and "The New Degree System." Although the source material of the publication is British education, the information and experiments (in most cases) could apply equally to education in the United States.

One of the latest of the Pergamon Press journals is *Educational Sciences*. Its articles are in English but it has summaries in English, French, German, and Russian. Sample titles from the first issue are: "Maturation and Learning in Adolescent Development," "The New Economics of Education," and "The Role of Educational Sciences in Curriculum Development."

The Journal of Aesthetic Education will explore the ways in which "the arts" may be taught as well as the reasons why they should be taught, by whom they should be taught, and for how long they should be taught. The editors of the *Journal* feel that each aspect of art education (that is: literature, music, visual arts, etc.) has become a culture unto itself and hostilities have developed among the members of each subgroup. The *Journal* will try to be a periodical for all the subgroups and will emphasize the fact that they are all parts of the larger family of the humanities.

The format of *Reading Research Quarterly* will accommodate lengthy and comprehensive reports thus permitting a depth and detail not possible in most journals reporting reading research. Each article will have summaries in French and Spanish and one entire issue a year will be devoted to the "Annual Summary of Research in Reading" by Helen M. Robinson. To bring professional information and thinking of the highest level to those who are interested in any aspect of safety education is the pledge of *Safety*. "Are We Asking the Right Questions

about Driver Education?" and "Safety: Lodestar in School Transportation" are two articles which seem to stand out in the initial number.

The maiden issue of *Education and Training of the Mentally Retarded* points out that in 1966 approximately thirty-five thousand teachers will teach approximately six hundred thousand educable and trainable mentally retarded children. As the official organ of the Council for Exceptional Children's Division on Mental Retardation, the journal will be a medium of continuing education for classroom teachers and future teachers of mental retardates. It will have, in addition to articles, four regular departments: "Educational Materials"; "Research Implications"; "Newsnotes from the U.S. Office of Education"; and "Teacher Education."

HISTORY, POLITICAL SCIENCE. *P. S.; a Lively Look at Your Past and Promise* is indeed lively and is also amusing and quite fascinating. It is supposed to "look at what we've been through and, by means of humorous articles, indignant diatribes, unabashed nostalgia, and anything else which comes to hand, try to figure out what it's done to us, and what we're likely to be up to next." Writers of its articles are said to include "sore heads, gentle scholars, concerned observers, experts, and wool gatherers." Without attempting to decide into which category each fits, one can note that the first issue includes such names as Isaac Asimov ("The Lovely Lost Landscapes of Luna") and Avram Davidson ("Don Sturdy and the 30,000 Series Books"). All in all, *P. S.* gives a lot of information and shows many of the more amusing aspects of the thirties and the forties in the United States.

Another "light" or "popularized" publication, *American History Illustrated* is based on solid research but will try to be interesting and exciting while avoiding sensationalism. The editors want to take the knowledge of the American past out of the hands of the scholars and put it into the hands of the people. Subject matter will range from prehistoric days up to the time of the Korean War and, as the title implies, there will be many illustrations, some in color. The first issue has, among many other topics, "Anesthesia—American Medicine's Gift to the World" plus information on the Battle of Kings Mountain and much about the "Merry" Oldsmobile.

Well documented articles which will benefit from extensive illustration are to be those which will be published in the *Smithsonian Journal of History*. It will not limit itself to American history or to any one subject area. "Locomotives on Stone" (Victorian locomotive lithographs) and "John Russell, R. A., and Early Lunar Mapping" are sample titles from the first issue.

Despite its title, *Canadian Journal of History* will cover all fields of history other than Canadian. Although scholars from Canada will, it is hoped, contribute the bulk of the articles published, offerings will be accepted from other countries as well. *Journal of Contemporary History* has a somewhat narrower field in that it will concentrate on central problems of contemporary European history. Each issue will be given over to works on a particular topic. The topic of the first is "International Fascism, 1920-1945"; the second, "The Left-Wing Intelligentsia Between the Two World Wars"; and the third, "1914."

Space in *Government and Opposition* will be apportioned among historical, sociological, and current political studies as its editors feel that answers to today's problems can often be found in the study of the past. The quarterly will treat of government and opposition wherever found: Africa, Europe, Asia, North America. The first issue includes "The Origins of Extra-Parliamentary Opposition in South Africa," "Policy Making in Religious Orders," and "Reflections on Opposition in Western Democracies." Persons well known in their fields (sociology, history, political science) are included on the magazine's international advisory and editorial boards.

LAW. What would seem to be a new idea in law publications has borne fruit in *Land and Water Law Review* issued under the auspices of the College of Law of the University of Wyoming, the Wyoming State Bar, and the Wyoming Water Research Institute. The *Review* will be devoted to the law of natural resources—their use, development, conservation. The field is a wide ranging one as it covers, of course, many activities such as mining, farming, hunting

and fishing, etc. One section of the *Review,* "Wyoming Division," will function as the organ of the Wyoming State Bar, superseding the *Wyoming Law Journal* which had been published since Dec. 1946.

Official organ of the African Law Association in America, *African Law Digest* will be "a compilation, in digest form, of the significant legislation, administrative regulations and notices, and reports of judical decisions of the states and territories of Africa together with notes and other items of interest." An added feature is an informational listing of African law journals.

The articles in *Lincoln Law Review,* published by students at Lincoln University in San Francisco, will be written by practicing lawyers and judges rather than by the students themselves. The *Review* hopes to present current trends in law and discuss current issues. The initial number has several studies of aspects of the Watts incidents and "The Constitutional Questions Respecting Birth Control and the Right of Privacy."

LIBRARY SCIENCE, DOCUMENTATION. *Perpustakaan Malaysia,* the journal of the Library Association of Malaysia, owes its birth to political reorganization as it represents a merger of the *Malayan Library Journal,* issued by the Library Association of the Federation of Malaya, and *Majallah Perpustakaan Singapura,* issued by the Library Association of Singapore. Time alone will tell whether the divorce of Singapore and Malaysia will cause the withdrawal of the Singapore members of the Library Association of Malaysia and, as a consequence, the birth of a new journal. One of the more valuable elements in the first issue of *Perpustakaan Malaysia* is a listing of Malaysian newspapers which are being published currently.

Organ of another association, *Inspel; International Newsletter of Special Libraries* (or *INSPEL,* if you prefer) was formed by the Special Libraries Section of the International Federation of Library Associations (IFLA) for international exchange of information and opinion. Articles in *Inspel* will be in English, French, or Russian. Usually the original text will be accompanied by summaries in the other two languages.

"Devoted to the encouragement and recording of research into matters of library science in the British Isles," *Research in Librarianship* will act as an exchange whereby the practicing librarian can inform the research worker of pressing problems and the worker inform the librarian of investigations under way or completed. The periodical includes short articles giving the results of projects completed as well as a listing of projects in progress.

Covering one of the "neglected aspects of our profession" *The Journal of Library History* is edited by Louis Shores and has an international advisory board which includes many distinguished names (John Metcalfe and Sir Frank Francis, to name only two). One can only predict (and hope) that since its area of specialization is so important and so uncrowded, that the *Journal* will have a long and useful life.

Documentation Abstracts, published by the American Documentation Institute and the Division of Chemical Literature of the American Chemical Society, will provide an expansion of kinds of service previously given in the "Literature Notes" section of *American Documentation* and the "Annotated Bibliography" of *Chemical Literature.* The journal not only writes of innovations in documents control but uses them, as it is produced from a "machine readable" record which can also be used for future indexes and other byproduct services. The quarterly contains short, signed abstracts of articles (from about one hundred periodicals) on documentation. The abstracts are arranged by subject but there is an author index. In the future, the publishers hope to extend coverage of the journal both in terms of the contents and in the organizations represented so it will become "a comprehensive source of information about literature in the field of documentation and related areas."

LITERATURE. A valuable addition to almost any library, the *Journal of Commonwealth Literature* will give information about creative writing in English from all Commonwealth countries except Great Britain. The need for such a publication is expressed by the editors when they say: "Clearly all writing recognizably in the English language takes its place within the body of English literature, and becomes sub-

ject to the criteria of excellence by which literary works in English are judged, but the pressures that act upon a Canadian writing in English differ significantly from those operating upon an Indian using a language not his mother tongue, just as both kinds differ from those that affect an Englishman." The *Journal* will have articles about specific writers and some of a more general nature on subjects such as Indian drama, New Zealand poetry, etc. It will include, also, critical articles and reviews. The 1964 installment of a regular feature, "Annual Bibliography of Commonwealth Literature," is one of the plus values of the first issue.

Prose, poetry, drawings, and texts of lectures are all included in *Barat Faculty Review*. The faculty of the Lake Forest (Ill.) College either contributes or recommends the inclusions in the *Review*. *Sundial*, "a literary review of Columbia University," is an independent publication founded with a grant from the Postcrypt Press through the Protestant Office of the University. Its purpose is to provide a voice for the literary talent of undergraduates, graduate students, faculty, alumni, and friends of Columbia.

Three other literary (or "little") magazines, *The Quest*, *Per/Se*, and *Omnis*, have not done much to explain their plans or purposes. *The Quest* and *Per/Se* include poetry, essays and stories, some of them by rather well-known people. *Omnis*, a very slight publication, appears to specialize in prose and says that it will be a "literary coffee break" and will include material that is fun to read and does not have any "pensive social or political commentary." To judge from the titles in the first issue ("First Aerial Dogfight," "Rebs Sink the Cairo") its pieces are rather more factual than imaginative.

A "journal of poetry and opinion," *Steppenwolf* includes reviews and letters in addition to actual poems. *New Measure*, another magazine of poetry, seems to mingle "known" and unknown poets, and plans in the future to print translations from foreign poets, and perhaps contributions on the other arts and on nonartistic subjects.

MEDICINE. Superseding the *Acta* of the International Union Against Cancer, *International Journal of Cancer* will carry reports of original research. *Diabetologia*, organ of the European Association for the Study of Diabetes, wants to facilitate the exchange of experience and information among European workers in the field but contributions of material will be accepted from all over the world. Text of the journal will be in English, French, or German with summaries in all three languages.

Short, unsigned summaries of articles in a selected list of the leading cardiovascular journals of the world will appear in *Cardiovascular Compendium*. Contents of the journals are to be reported within a month of publication for domestic journals and within a month of direct receipt for foreign journals.

Each issue of *Seminars in Roentgenology* will deal in depth with a single topic of current importance. The quarterly publication is designed for the practicing radiologist so research and technics will be discussed only as they provide documentation for or clarification of clinical, pathologic and roentgenologic aspects of the subject matter.

PHILOSOPHY, RELIGION. "A new kind of philosophical periodical," the *Bulletin of Philosophy* is to be a service bulletin for teachers, librarians, students, and others actually working in the field. It will carry news of meetings and congresses, new programs of study, lecture series, deaths, appointments, positions available and much similar material. *Listening* was designed especially for a college audience: theology, philosophy, and humanities students. It is published by the Dominicans at Aquinas Institute of Philosophy and Theology (Dubuque, Iowa) but will put emphasis on dialogues between those of differing ideas. The "Ecumenical Forum" which features a Protestant and a Catholic discussing a common subject will be a regular feature of each issue. Some articles in the first issue are: "Science, Theology and Tomorrow"; "The Playboy in Profile"; and "Beyond Vatican II."

There are, at the present time, journals devoted to eastern Christendom in the French, German, Italian, Greek, Rumanian, and Arabic languages. *Eastern Churches Review* has been started to provide equivalent service for readers of English. The *Review*

will explore the origins, history, theology, liturgy, and other aspects of the eastern churches for, as the editor says, they are "impinging on us constantly, on every level from the daily news to theological and ecumenical problems." In addition to more general or historic material the *Review* will include current information such as obituaries, news of appointments, and reviews of books, music, and art exhibitions.

PSYCHOLOGY. Published by the Society of Multivariate Experimental Psychology, *Multivariate Behavioral Research* will include, as well as articles, commentaries by editors and readers on papers which have appeared. *International Journal of Psychology,* organ of the International Union of Psychological Science (formerly International Union of Scientific Psychology), is "devoted to cross-cultural comparative and cooperative research in general, genetic, and social psychology throughout the world." It will emphasize basic research and theory rather than technical and applied aspects.

RECREATIONS. In February 1966 in New York a nucleus of collectors of Israel coins founded the International Israel Numismatic Society and now the society is publishing *Journal of Israel Numismatics.* The *Journal's* range of subjects will cover "the land of Israel," that is, its limits will be geographical rather than chronological.

With many lovely photographs, *Antique Talk* will present a picture of its whole subject from Louis XV to country antiques. The editors intend "to get off the beaten track and not to forget anything." Two of the most interesting presentations in the first issue are "The Golden Years of American Silver" and "Furniture from 1629 to 1850."

Outdoors Calling! would seem to be a magazine for the "amateur" outdoorsman. It has easy-to-read, short articles on subjects as diverse as rock collecting and trailer trips, and many illustrations.

SOCIAL SCIENCES. *Superseding Community Development Bulletin* (issued Dec. 1949 to Dec. 1964), the *Community Development Journal* will carry notices of new publications and information on new ventures and techniques from all parts of the world. Its coverage will include, also, programs closely related to community development (such things as mass education, adult literacy, women's and youth work).

The first purpose of *The Cornell Journal of Social Relations* will be to provide "a horizontal linkage among these disciplines [psychology, child development, anthropology, industrial and labor relations, etc.] which all derive from a common generic base—*i.e.*—social relations." The *Journal* will publish the work of graduate students and the editors feel that science may benefit if such student productivity is more widely distributed than is now the case. Another publication giving preference to the work of students is *Issues in Criminology,* the journal of the graduate students of the School of Criminology of the University of California at Berkeley. The journal will focus on the developing controversial issues, each number to be devoted to one theme (as v. 1, no. 1, Criminal Responsibility; v. 1, no. 2, Criminology as a Discipline).

Modern Cities Via Transportation will deal with railroading, mass rapid transit, urban development, and regional planning. One can only agree with the editors when they warn that "the transportation problem is central to America's future growth" and that "we must reduce congestion and maintain the central city areas while expanding regional transportation networks to keep pace with our mushrooming communities." It is hoped that the new publication will be able to show some solutions to the problem. The first issue explores the new metro transit system of Toronto.

TECHNOLOGY. Matters of great present day interest fall into the field of study of *Bulletin of Environmental Contamination and Toxicology.* Rapid publication will be provided for significant advances and discoveries in pesticide residue research, air, soil, and water contamination and pollution and other disciplines concerned with the introduction, presence, and effects of toxicants in the total environment. The results of current research will be presented in brief reports. Review articles and summaries of papers to be issued in full form in other publications will not be included.

Journal of Food Technology covers a field "ranging from pure research in the various sciences associated with food to practical experiments designed to improve tech-

nical processes." Sample articles from the first issue are "The Glassy State in Certain Sugar-Containing Food Products" and "A Note on Ethyl Acetate Formation in Canned 'Draught' Beer."

Although *Computing* will publish original papers and review articles from the entire field of electronic computing methods and their applications, it will not include articles concerned with data processing and computer technology. Material in the publication will be in English or German with short summaries in both languages.

Vertical World will try to be a spokesman for the vertical lift segment of the aerospace industry and will publish articles, news, and general information in its subject field. A timely discussion in the heavily illustrated first issue is "The Vertical War in Vietnam."

PERIODICALS

African Law Digest. Mr. Cliff F. Thompson, Box 31, 435 West 116th St., New York 10027. v. 1, no. 1, July/Sept. 1965. Quarterly. $3.50 (per issue). 66-9898.

A.I.D.C. Journal. American Industrial Development Council, Inc., 230 Boylston St., Boston 02116. v. 1, no. 1, Jan. 1966. Quarterly. $6. 66-9857.

American History Illustrated. Historical Times, Inc., 302 York St., Gettysburg, Pa. 17325. v. 1, no. 1, Apr. 1966. Monthly (except Sept. and Mar.). $10. 66-9868.

Antarctic Journal of the United States. Information Officer, Office of Antarctic Programs, National Science Foundation, Washington, D.C. 20550. v. 1, no. 1, Jan./Feb. 1966. Bimonthly. Price not given. 66-9856.

Antique Talk. Smith Publishing Co., Inc., 24 Genesee St., Utica, N.Y. 13503. v. 1, no. 1, May 1966. Bimonthly. $3. 66-9905.

The Appalachian South. P.O. Box 4104, Charleston, W.Va. v. 1, no. 1, Summer 1965. 4 no. a year. $5. 66-9890.

Art and Artists. Hanson Books Ltd., 16 Buckingham Palace Road, London SW 1. v. 1, no. 1, Apr. 1966. Monthly. $8. 66-9880.

Barat Faculty Review. The Editor, Barat Faculty Review, Barat College, Lake Forest, Ill. v. 1, no. 1, Jan. 1966. Semiannual. $2. 66-9858.

Bulletin of Environmental Contamination and Toxicology. Springer-Verlag New York, Inc., 175 Fifth Ave., New York 10010. v. 1, no. 1, Jan./Feb. 1966. Bimonthly. $15. (for institutions). 66-9881.

The Bulletin of Philosophy. P.O. Box 4434, Brookland, Washington, D.C. 20017. v. 1, no. 1, Jan. 1966. Monthly (Oct.-May). $6. 66-9869.

Business and Public Administration Student Review. School of Business and Public Administration, University of Missouri at Kansas City, Kansas City, Mo. 64110. v. 1, no. 1, Fall 1965. Semiannual. $2.50. 66-9852.

Canadian Journal of History. Box 384, Sub Post Office No. 6, Saskatoon, Saskatchewan, Canada. v. 1, no. 1, Mar. 1966. Semiannual. $3.50. 66-9904.

Cardiovascular Compendium. Compendium Publications, 121 North Broad St., Philadelphia 19107. v. 1, no. 1, Oct. 1965. Monthly. $48. (nonprofit institutions). 65-9998.

°*Clinical and Experimental Immunology.* Blackwell Scientific Publications Ltd., 24-25 Broad St., Oxford, Eng. v. 1, no. 1, Jan. 1966. Quarterly. $17.50. 66-9870.

The Community Development Journal. Editor, Community Development Journal, 22 Kingston Road, Didsbury, Manchester 20, Eng. no. 1, Jan. 1966. Quarterly. $3. 66-9882.

Computing. Springer-Verlag, Mölkerbastei 5, 1010 Wien, Austria. v. 1, no. 1, 1966. 4 no. a year. $24. 65-9999.

°*Conditional Reflex; a Pavlovian Journal of Research & Therapy.* J. B. Lippincott Co., East Washington Square, Philadelphia 19105. v. 1, no. 1, Jan./Mar. 1966. Quarterly. $10. 66-9911.

The Cornell Journal of Social Relations. The Editors, Cornell Journal of Social Relations, Dept. of Sociology, Cornell University, Ithaca, N.Y. 14850. v. 1, no. 1, Spring 1966. Semiannual. $3. 66-9891.

Dédalo. Museu de Arte e Arqueologia da Universidade de São Paulo, Cidade Universitária "Armando de Salles Oliveira," Caixa Postal 8191, São Paulo, Brasil. v. 1, no. 1, June 1965. Semiannual. $3. 65-9988.

Diabetologia. Springer-Verlag New York, Inc., 175 Fifth Ave., New York 10010. v. 1, no. 1, Aug. 1965. 4 no. a year. DM 60.- 65-9991.

Documentation Abstracts. c/o American Documentation Institute, 2000 P St. N.W., Washington, D.C. 20036. v. 1, no. 1, Mar. 1966. Quarterly. $8. 66-9894.

Eastern Churches Review. Holywell Press Ltd., 9 Alfred St., Oxford, Eng. v. 1, no. 1, Spring 1966. Semiannual. $3. 66-9909.

Education and Training of the Mentally Retarded. Division on Mental Retardation, Council for Exceptional Children, NEA, 1201 16th St. N.W., Washington, D.C. 20036. v. 1, no. 1, Feb. 1966. 4 no. a year. $5. 66-9913.

Educational Sciences. Pergamon Press Inc., 44-01 21st St., Long Island City, N.Y. 11101. v. 1, no. 1, Feb. 1966. 3 no. a year. $20. 66-9892.

°*Experimental Brain Research.* Springer-Verlag New York, Inc., 175 Fifth Ave., New York 10010. v. 1, no. 1, 1966. Irregular. $18. (per vol.). 65-9990.

Government and Opposition. Weidenfeld and Nicolson, 20 New Bond St., London W 1. v. 1, no. 1, Oct. 1965. Quarterly. 45*s.* 65-9983.

Highrise. Lander Publications Division, Creative Media Inc., 239 S. Robertson Blvd., Beverly Hills, Calif. v. 1, no. 1, Dec. 1965. Monthly. $5. 65-9902.

Industrial Research News. United Nations, Sales Section, New York 10017. v. 1, no. 1, Jan. 1966. Frequency not given. Price not given. 66-9853.

Inspel; International Newsletter of Special Libraries. INSPEL, c/o K. A. Baer, 1625 L St. N.W., Washington, D.C. 20036. v. 1, no. 1, Apr. 1966. Irregular. $4. (4 issues). 66-9883.

International Journal of Cancer. Munksgaard Publishers, 47, Prags Boulevard, Copenhagen S(Denmark). v. 1, no. 1, Jan. 1966. 6 no. a year. $25. 66-9863.

International Journal of Psychology. Dunod, 92, rue Bonaparte, Paris 6°, France. v. 1, no. 1, 1966. Quarterly. 35F. 66-9906.

°*The International Journal of the Addictions.* Institute for the Study of Drug Addiction, 680 West End Ave., New York 10025. v. 1, no. 1, Jan. 1966. Semiannual. $6. 66-9896.

°*Inventiones Mathematicae.* Springer-Verlag New York, Inc., 175 Fifth Ave., New York 10010. v. 1, no. 1, Feb. 1966. Frequency not given. $24. (4 issues). 66-9875.

°*Investigative Radiology.* J. B. Lippincott Co., East Washington Square, Philadelphia 19105. v. 1, no. 1, Jan./Feb. 1966. Bimonthly. $14. 66-9903.

Issues in Criminology. Editor-in-Chief, Issues in Criminology, 101 Haviland Hall, University of California, Berkeley, Calif. v. 1, no. 1, Fall 1965. 2 no. a year. $4. 66-9872.

The Journal of Aesthetic Education. Office of the Superintendent of Public Instruction, Springfield, Ill. Spring 1966. Frequency not given. Price not given. 66-9897.

°*Journal of Cell Science.* Cambridge University Press, American Branch, 32 East 57th St., New York 10022. v. 1, no. 1, Mar. 1966. Quarterly. $27.50. 66-9876.

The Journal of Commonwealth Literature. Heinemann Educational Books Ltd., 48 Charles St., London W 1. no. 1, Sept. 1965. Annual (semiannual beginning in 1967). $6.50 (4 issues) 65-9987.

Journal of Contemporary History. Weidenfeld and Nicolson, 20 New Bond St., London W 1. v. 1, no. 1, 1966. 4 no. a year. $7. 66-9877.

Journal of Food Technology. Blackwell Scientific Publications Ltd., 5 Alfred St., Oxford, Eng. v. 1, no. 1, Mar. 1966. Quarterly. $17.50. 66-9908.

Journal of Israel Numismatics. P.O. Box 34, Cliffside Park, N.J. 07010. v. 1, no. 1, Feb./Mar. 1966. Bimonthly. $5. 66-9884.

The Journal of Library History. Miss Marguerite Sellars, Library School, Florida State University, Tallahassee, Fla. 32306. v. 1, no. 1, Jan. 1966. Quarterly. $10. 65-9989.

°*Journal of Materials.* American Society for Testing and Materials, 1916 Race St., Philadelphia 19103. v. 1, no. 1, Mar. 1966. Quarterly. $15. 66-9885.

°*Journal of Pediatric Surgery.* Grune & Stratton, Inc., 381 Park Ave. South, New York 10016. v. 1, no. 1, Feb. 1966. Bimonthly. $12. 66-9878.

°*Journal of Psychopharmacology.* Elias Publications, P.O. Box 3194, Margate, N.J. 08402. v. 1, no. 1, 1966. 4 no. a year. $10. 66-9910.

°*Journal of Stored Products Research.* Pergamon Press, 44-01 21st St., Long Island City, N.Y. 11101. v. 1, no. 1, Sept. 1965. Quarterly. $30. 65-9994.

Land and Water Law Review. University of Wyoming, College of Law, University Station, Box 3035, Laramie 82070. v. 1, no. 1, 1966. Semiannual. $5. 66-9912.

Lincoln Law Review. Lincoln University, 2518 Jackson, San Francisco 94115. v. 1, no. 1, Dec. 1965. Semiannual. $4. 65-9992.

°*Lipids.* Circulation Dept., American Oil Chemists' Society, 35 E. Wacker Drive, Chicago 60601. v. 1, no. 1, Jan. 1966. Bimonthly. $14. (nonmembers). 65-9850.

Listening. 2570 Asbury Road, Dubuque, Iowa 52002. v. 1, no. 1, Winter 1966. 3 no. a year. $2. 65-9985.

°*Medizinhistorisches Journal.* Georg Olms, 32 Hildesheim, Am Dammtor. Bd. 1, Heft 1, 1966. Quarterly. DM 48.- 66-9914.

Mississippi Valley Journal of Business and Economics. Division of Business and Economic Research, College of Business Administration, Louisiana State University in New Orleans, Lakefront, New Orleans 70122. v. 1, no. 1, Fall 1965. 2 no. a year. $3. 66-64085.

Modern Cities Via Transportation. Eutter Publications, Inc., 625 Stanwix St., Pittsburgh 15222. v. 1, no. 1, May 1966. Bimonthly. $5. 66-9893.

Multivariate Behavioral Research. Associate Editor, Multivariate Behavioral Research, Texas Christian University, Fort Worth 76129. v. 1, no. 1, Jan. 1966. Quarterly. $12. 66-9860.

New Measure. Donald Parsons and Co., Ltd., 1a Littlegate St., Oxford, Eng. v. 1, no.

1, Autumn 1965. Quarterly. Price not given. 66-9886.

Omnis. P.O. Box 22034, Houston, Tex. 77027. v. 1, no. 1, 1966. Frequency not given. Price not given. 66-9861.

Outdoors Calling! Benedict-Nerpel, Inc., 12500 Riverside Drive, North Hollywood, Calif. 91607. v. 1, no. 1, Mar. 1966. Monthly. $5. 66-9854.

Perpustakaan Malaysia. c/o Library, University of Singapore, Bukit Timah Road, Singapore. v. 1, no. 1, June 1965. Semiannual. $6. SA 66-1902.

Per/Se. Per/Se Inc., Box 2377, Stanford, Calif. 94305. v. 1, no. 1, Spring 1966. Quarterly. $5. 66-9887.

P. S.; a Lively Look at Your Past and Promise. Mercury Press, Inc., 347 E. 53rd St., New York 10022. v. 1, no. 1, Apr. 1966. Bimonthly. $3.50. 66-9873.

The Quest. P.O. Box 207, Cathedral Station, 219 West 104th St., New York 10025. v. 1, no. 1, Winter 1965/66. Quarterly. $3.50. 66-9864.

Reading Research Quarterly. International Reading Association, P.O. Box 695, Newark, Del. 19711. v. 1, no. 1, Fall 1965. Quarterly. $10. 66-9907.

Research in Librarianship. Subscription Manager, Research in Librarianship, 34 Norfold St., Werneth, Oldham, (Lanc.), Eng. v. 1, no. 1, Oct. 1965. 3 no. a year. 15/- 65-9993.

**Respiration Physiology.* North-Holland Publishing Co., P.O. Box 103, Amsterdam. v. 1, no. 1, 1966. Frequency not given. $15. (per vol.). 66-9902.

Safety. National Commission on Safety Education, National Education Association, 1201 16th St. N.W., Washington, D.C. 20036. v. 1, no. 1, Sept./Oct. 1965. 5 no. a year. $6. 66-9865.

Seminars in Roentgenology. Grune & Stratton, Inc., 381 Park Avenue South, New York. v. 1, no. 1, Jan. 1966. Quarterly. $12. 66-9851.

The Smithsonian Journal of History. P.O. Box 1001, Berkeley, Calif. 94701. v. 1, no. 1, Spring 1966. Quarterly. $7.50. 66-9915.

Steppenwolf. The Editors, Steppenwolf, 3332 Harvey St., Omaha, Nebr. 68131. no. 1, Winter 1965/66. Annual. $2. 66-9866.

Sundial. Postcrypt Press, 110 Earl Hall, Columbia University, New York 10027. v. 1, no. 1, Spring 1966. 3 no. a year. $1.25. 66-9879.

Trends in Education. Her Majesty's Stationery Office, 49 High Holborn, London, WC 1. no. 1, Jan. 1966. Frequency not given. 3*s* 6*d* (per issue). 66-9900.

Vertical World. Press Tech Inc., 815 Davis St., Evanston, Ill. 60201. v. 1, no. 1, June 1966. Monthly. $10. 66-9901.

The World of Comic Art. World of Comic Art Publications, Box 507, Hawthorne, Calif. 90250. v. 1, no. 1, June 1966. Quarterly. $3.50. 66-9916.

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Book Reviews

Bibliographical Control and Service. By Roy Stokes. New York: London House and Maxwell, 1965. 125p. $4.95. (65-26280).

The purpose of this little textbook is a modest one, viz., to assist the student who is preparing himself for "Paper Four of Part One" of the recently revised examination syllabus of The (British) Library Association. The result, appropriately enough, is a modest publication in the writing of which one feels that the author, well known for his editorship of the much more distinguished *A Student's Manual of Bibliography*, was somewhat ill at ease in being obliged to follow strictly "the order of the items in the syllabus of this examination."

More than one American librarian must have been surprised in the past year or two by what would appear to be a minor explosion in England in the production of textbooks of librarianship. Time was when The Library Association, The Association of Assistant Librarians, and Grafton, with an occasional and usually more notable contribution from Allen and Unwin, just about covered everything. Today a small bandwagon seems to be rolling and on it we find Deutsch (the London publisher of *Bibliographical Control and Service*), Clive Bingley, Crosby Lockwood, Butterworths, and others. The situation is such that it might well call for a modicum of "bibliographical control" all on its own. Certainly it is a matter for regret that much of this greatly increased output is undistinguished, betraying obvious signs of hasty preparation and carrying with it the unmistakable odor of a British library school classroom (the author of the work under review is head of the Loughborough school of librarianship). Maybe the new examination syllabus is largely to blame for this sad state of affairs. From the evidence revealed in Mr. Stokes's textbook "Paper Four of Part One" must be something of a hotchpotch. In the first chapter, for example, we are brought up against the formidable forebodings of Vannevar Bush; in chapter 5 we are given such bits of information as: "One of these is the *recto* page, which is the right-hand one when looking at the complete opening of a book while the *verso* page, or the *verso* of a leaf, is the one on the reverse"! Somehow one feels that the author was more on his home ground in this very useful chapter on "Contemporary Production Methods." The difficulty is seeing what it has to do with all that has gone before.

The major part of the book and, presumably, of "Paper Four of Part One" is concerned with a listing of the major general bibliographies, selection aids, and reference works, with which the student is expected to familiarize himself. Whenever possible, references to the Winchell or Walford numbers or both are given. This is a useful device and certainly saves what would otherwise be wasteful repetition. At the same time it scarcely enhances the appearance of the page.

The listings, like the whole publication, are comparatively modest and, in general, somewhat insular. This is perhaps inevitable in view of the purpose of the book. Certainly the librarian of any sizeable academic library in the United States would find the lists of little value as aids to collection building. Indeed there are times when insularity goes too far. Whatever they may do at Harvard, the Library of Congress spells catalog without the *ue*!

The book was produced in Great Britain —again modestly and at an original price of 18*s*, which is almost half the American publication price at the current rate of exchange.—*J. Clement Harrison, Graduate School of Library and Information Sciences, University of Pittsburgh.*

The Public Library and the City. Ed. by Ralph W. Conant. Cambridge, Mass.: The MIT Press, 1965. xii, 216p. $6.75 (65-27504).

In 1963, the Joint Center for Urban Studies (MIT and Harvard) and the National Book Committee sponsored a Symposium on Library Functions in the Changing Metropolis. *The Public Library and the City* is an edited collection of some of the papers presented at the symposium—not all of the papers delivered there have

been included—plus three essays especially prepared for this publication. The contributors are political and social scientists, economists, educators, communications experts, and librarians.

The volume is organized to show a concern first with some of the people who use public libraries as well as those who do not use them; then with libraries themselves; and finally with trends in urban politics, government, and fiscal policies affecting libraries.

Much of what is discussed here has a familiar ring: the effect on the library of the growing student population, the increasing number of older people, the movement (except for ethnic minorities) to the suburbs, the ineffectiveness of the library in reaching the lower half of the working class, and difficulties arising from the library's effort to be all things to all people, to name a few.

The most provocative contributions are those of the social scientists. Howard S. Becker, for example, contributes brilliantly to our understanding of the difference between college and noncollege youth but doubts that the public library is equipped to deal with the problems of the latter. Charles M. Tiebout and Robert J. Willis examine the question of public support for libraries and conclude that, although federal, state, and local governments have a responsibility, the individual library user has not paid his full share. Edward C. Banfield, in the same vein, takes a very hard look indeed at the *raison d'être* of the public library and finds that it has ceased to serve its original purpose and has not acquired a new purpose that it can justify. Banfield believes the public library should be concerned with the serious reader only and suggests that it offer services which, taken together, more closely resemble special librarianship than what is normally conceived of as public librarianship or even present-day research librarianship: provision of cubicles, maintenance of up-to-date, annotated bibliographies, "personal" librarians who would take telephone "orders," arrange home deliveries and pickups, and offer assistance in finding books for readers to *buy*, as well as tutorial service in specialized subject areas. And Richard Meier thinks that the routine and high-volume demands for information will in the future be provided by regional data banks and documentation centers, leaving it to the library to serve the needs of adult education and scholarship by making available materials that cannot be stored and retrieved conveniently by mechanical means.

The whole spectrum of the urban library problem is considered here. The need for further exploration is indicated by the inclusion of a chapter called "Some Research Questions." Nevertheless these essays, together with the annotated bibliography which accompanies them, will serve as a useful guide and point of departure for librarians and others concerned with public library service in metropolitan areas.—*James W. Henderson, The New York Public Library.*

The Superior Student in American Higher Education. Ed. by Joseph W. Cohen. New York: McGraw-Hill Book Company, 1966. xvi, 299p. $7.95 (65-27675).

"The Honors System . . . at its worst . . . is an educational experiment worthy of objective, scientific attention." This, rather than merely "the superior student" is the focus of this volume which, briefly, traces the history of the honors movement in America; spells out some of the characteristics and needs of the superior student (and inadvertently exposes the preciousness of some of them) that lead to the development of honors programs; gives case studies of honors work in such differing academic milieus as liberal arts colleges, private and state universities, and secondary schools; and treats of the differing objectives and methods of departmental and college honors. Few have been so long and so closely connected with the honors movement or done so much to forward it as the editor and principal contributor. His collaborators are equally well qualified.

The honors movement in the United States began early in this century but did not gain real impetus until Aydelotte established his well known program at Swarthmore, and John Dewey laid emphasis on experimentation in education—both in the 1920's. A slow but steady growth eventually led to the founding of the Inter-University Committee on the Superior Student. The trebling of the number of honors

programs between its founding in 1957 and its formal termination in 1965 gives some measure of its importance.

The editor makes two essential points about an honors program: First, that "a beginning must be made" even though lacking assurance of adequate support and with planning that is less than perfect; and, second, that an honors program "must always be something dynamic, something vital, something unstereotyped." (An appendix to the third chapter lists "The sixteen major features of a full honors program—an admirable checklist for those engaged in or planning honors work.) There is abundant evidence in the following chapters that these principles are frequently ignored: too often programs are postponed awaiting ideal circumstances; or, once set in motion, they become, tragically often, dull, routine, sterile. An honors program needs superior teachers as well as superior students.

A chapter of particular interest and significance is that on "Honors and the Sciences," in which the difficulties of honors work in science is explored in depth; and there are indeed problems. Nevertheless, a few science honors programs have been developed, although they are most frequently departmental programs involving undergraduate research than all-college programs for the nonscientist. ". . . some public *understanding* of scientific doctrine is imperative. In their own self-interest, if not for less selfish motives, scientists must engender sympathetic reception of their proposals. What better audience could be asked than a group of honors students?"

The objectivity of the contributions is noteworthy throughout, and nowhere more than in the chapter on the evaluation of honors programs, in which are summarized critical studies of honors, the place of the honors student in the mind of his peers, his later achievement, and so forth. In all, this represents a useful and valuable contribution to the literature on one of the more interesting and productive aspects of American higher education.

If the librarian wishes some enlightenment of the place of the library in honors work, he will have to look elsewhere. There is literally no mention of libraries in the book! Where, one wonders, lies the fault? Is the library of no significance in honors work? Does it make no contribution? Perhaps its usefulness is so accepted that it needs no mention? Or perhaps those concerned with honors have not exploited the library? 'Tis a puzzlement!—*John M. Dawson, University of Delaware.*

Library Publications. By William R. Holman. San Francisco: Roger Beacham, 1965. viii, 67p. + pocket with inserts. $28.50 + $16.50 (65-28969).

This sumptuous volume, in the tradition of Adrian Wilson's *Printing for Theater,* is a valuable addition to the notable list of beautiful books produced by fine printers in the San Francisco Bay Area. Composed in Monotype *Van Dijck,* with Bruce Rogers' *Centaur* for display, printed on Curtis rag paper, hand-bound with hand-marbled paper over boards, the book has numerous examples of announcements and leaflets tipped in by hand as illustrations. It was designed by Barbara Holman, who also did the hand-marbling of the cover papers, and printed by Graham Mackintosh.

Library Publications contains many valuable suggestions for anyone responsible for the format of library announcements, booklists, etc. Its chapters are titled: Approach to Printing, Simplicity in Design, Planning is Essential, Personality of Type, Paper is Persuasive, The Printing Process, and Printing on a Budget. These chapters are filled with advice on paper, type faces, choice of size of stock, color, illustrations, and methods of printing.

Available only from the publisher (406 Pacheco, San Francisco, Calif. 94116), libraries may list the two parts separately on the order, but both must be included. The volume is recommended for all collections of fine printing.

Mr. Holman's purpose was to "foster a renewal of interest in printing, especially, in printing for the library." Further, he believes that "The book should prove of special value to the medium and small libraries—public, college, and school—who do not have the services of a graphic artist." But there is a difficulty here, as is indicated by the suggested device of separating the prices of the book and the inserts. What small- or medium-sized library budget can stand $45 for a "a practical 'how-to' book"?

It is apparent to this reviewer that Mr. Holman and his talented designer-wife are a combination of sophisticated taste and high capability that is somewhat less than frequent in the profession. What is possible for them, having a Colts Armory Press and a careful selection of imported type, is simply beyond the reach of most librarians, nay, even of most academic librarians favored with a university press.

One would hope that there are enough large libraries and collectors at large to exhaust the edition of 350 copies. (Unfortunately, this probably means that the volume will be available to those who, in a sense, need it least.) Hopefully, too, every library school library will procure a copy, which might be the best way to maximize the book's usefulness. If only a small handful of beginning librarians were fired by the passion and good taste exhibited by Mr. Holman, printing for libraries might one day be revolutionized.

A more practical and immediate route to the upgrading of library publications—so fervently desired by Mr. Holman—would seem to be this: (1) raise the level of taste on the part of librarians, and (2) encourage them to seek out a high-quality printer who is, or who has on his staff, a good designer. *Library Publications* is a notable contribution to the first of these goals.—*Wm. R. Eshelman, Bucknell University.*

Special Libraries: A Guide for Management. Ed. by Edward G. Strable. New York, Special Libraries Association, 1966. 63p. illus. $4. (66-17107).

Special Libraries: A Guide for Management fills a gap in the literature of special librarianship. Rather than being aimed at the neophyte special librarian, this slim, paperbound book is intended for the use of management personnel in deciding the when, why, how, and what of a special library. Written by six special librarians, the information it contains is accurate, current, and well-presented. It is not written as a quick course in librarianship; it presents the type of information the manager of a research laboratory, for example, requires to determine the need of his organization for a library, the functions he might expect such a library to perform, and the probable costs of establishment and operation.

A number of photographs, floor plans, and tables augment the text nicely. The selection of examples has been chosen thoughtfully to include the whole range from very small to very large special libraries. The data supplied to demonstrate the probable costs of establishment and operation is as current as possible and some suggestions concerning trends are made which should keep the book from being outdated too quickly. Three approaches to budget planning are suggested and it might be possible to use them as a check on each other. The data in this section may also have some useful applications in the estimation of operational costs of "special" libraries which are a part of university library systems. The increasing volume of contract research on university campuses has resulted in a significant growth of special libraries within the academic milieu.

A useful bibliography, again aimed more at management than librarians, is appended. This supplements the numerous books and articles mentioned in the text.

This book is a powerful tool for the librarian who steps into the normally chaotic situation which pertains when an industrial or business concern suddenly senses a need for a library. A few copies in the hands of management would lend support to the librarian's desire to provide optimum service. Unfortunately, it is not likely that too many managers will see a copy before their literature problems become overwhelming. The Illinois Chapter of Special Libraries Association is to be congratulated for sustaining this project and producing this useful pamphlet.—*Robert E. Burton, University of Michigan.*

Lyceum to Library: A Chapter in the Cultural History of Houston. By Orin Walker Hatch. Houston: Texas Gulf Coast Historical Association, 1965. [ix], 73p. $3.

Every institution should have its history recorded. This maxim is as true for a cultural institution as for a financial, governmental, or academic one. Library histories are important if for no other reason than

that they lend support to the *raison d'être* of libraries themselves. But the histories provide much more than that, of course: practices and developmental programs currently in force can be better understood and justified through a delineation of past experiences, early patterns, historical events, and original sources. Contrary to popular thinking, the past record of an eminent library can be an interesting bit of reading, assuming that one has an interest in the profession or the particular library.

The early history of the Houston public library has been compiled by Orin Walker Hatch, who was employed in that library for five and one-half years. It was issued as a small paperback volume in the *Publication Series* of the Texas Gulf Coast Historical Association. Other worthwhile titles that have been issued in the series, not always local in scope, are *A Short History of the Sugar Industry in Texas,* by William R. Johnson; *Crusade for Conformity; the Ku Klux Klan in Texas: 1920-1930,* by Charles C. Alexander; and *The European Common Market,* by W. L. Clayton.

Mr. Hatch is a graduate of the University of Oklahoma library school and the newly appointed librarian of New Mexico Junior College at Hobbs. He assembled the material for this study in the course of preparing a thesis for the Master of Arts degree at the University of Houston. The published result is hard core historical matter with little or no literary dressing. One reads the work for fact, not fancy. It has none of the enlivened readibility of Harry Clemons's *University of Virginia Library, 1825-1950,* or Frank B. Woodford's *Parnassus on Main Street; a History of the Detroit Public Library.*

Beginning with the founding of the Houston Lyceum in 1837 the story is fraught with failure, the abandonment of one lyceum-library after another, until Andrew Carnegie rescues the perishing cultural societies, too numerous to recall. Mr. Hatch's story ends with the erection of the Italian Renaissance building of the Houston Lyceum and Carnegie library in 1904. In the appendix a short 'Epilogue' by the present librarian, Harriet Dickson Reynolds, describes well but too briefly the services and size of the Houston public library today. The author's chronology and bibliographical essay are helpful, and the index is good.

The reader feels that he has begun the tale—now he would like to finish it. Who will write the next (and perhaps the most interesting) part of the story of one of America's potentially great public libraries? —*Roscoe Rouse, State University of New York at Stony Brook.*

■■

Art Reference Citation

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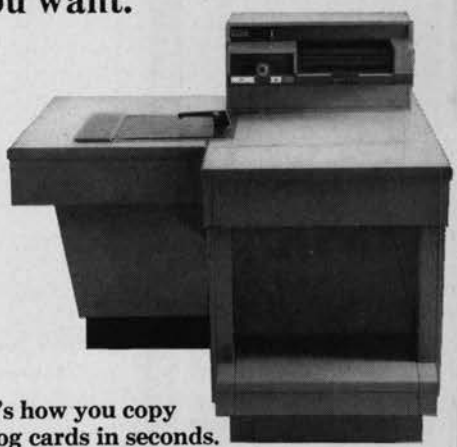

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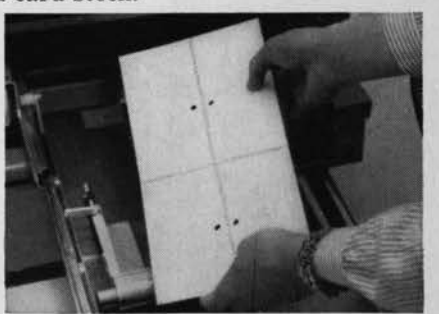

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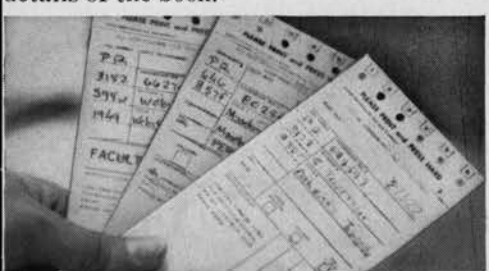

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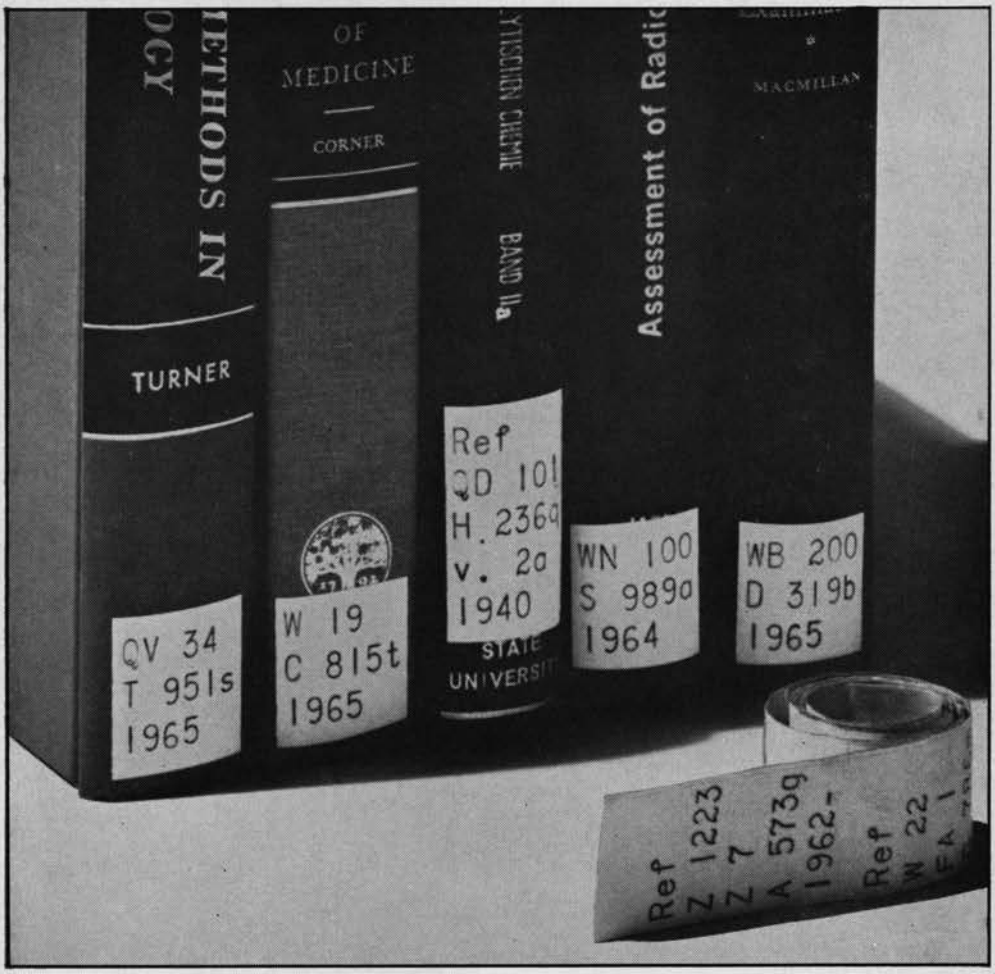

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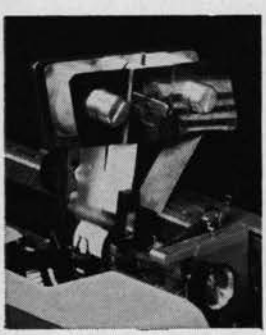

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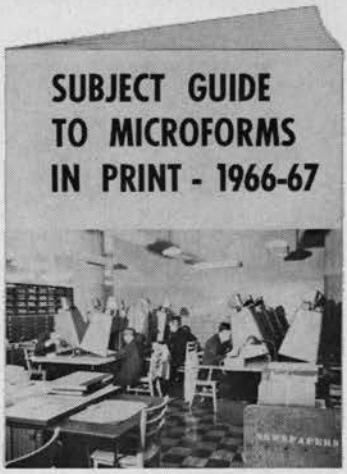

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